ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

CONTRACTORS and INSPECTORS number

McGRAW HILL CO. OF CALIFORNIA

PRICE 25c

AUG. 1938

THIS ELECTRIC 'AUTOMEAL'
COOKS FOOD
HERE'S AN AUTOMATIC LOW COST
plug-in kitchen
A PRODUCT OF Westinghouse
AUTOMEAL
Cooks an Entire Meal for 8 people
Here's the electric roaster that has everything! It occupies only two feet of space, yet performs every cooking operation quicker, cheaper, and easier. It roasts, broils, bakes, toasts, grills, fries—yet uses no more electricity than a modern electric iron. Plugs into any electric outlet. No special wiring necessary. Cash price $24.95, complete with utensil set and valuable free table. Easy terms. Broiler-griddle unit for grilling, toasting and frying, $4.95 extra. See the Automeal today.
$4.95 STURDY STEEL TABLE free
INTRODUCTORY
SALE OFFER
'AUTOMEAL' COMPLETE with UTENSILS and STEEL TABLE
A $29.90 VALUE ONLY $24.95 CASH
$2.95 DOWN
ONE YEAR TO PAY BALANCE
BROILER-GRIDDLE UNIT $4.95 EXTRA
AT ALL DEALERS OR THE NEAREST OFFICE OF THE SOUTHERN CALIFORNIA EDISON COMPANY LTD.
Widening the Appliance Market
MAKE BIG KITCHE
AUTON
plug-
AT A BARGAI
Does Every Cooking Operation Quicker, Easier, Better
AT ALL DEALERS or your EDISON OFFICE
$4.95 STURDY STEEL TABLE
ll the Meals
tter, cooler

Helping to Popularize the "Plug-In Kitchen"

The sensational advance of the electric roaster is one of the bright spots of the electrical industry. Gloomy predictions that the roaster would have an adverse effect on range sales have been completely refuted. In fact, it has been proved that selling a roaster is an excellent first step toward securing a range customer.

The phrase "Plug-In Kitchen" has been coined to describe this handy appliance and the Edison Company has been putting all the force of its advertising and merchandising behind a concentrated drive for roaster sales. Early reports indicate an even greater success than the most optimistic expectations.

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

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The All-Industry Magazine of Progress

ELECTRICAL WEST

MEMBER AUDIT BUREAU OF CIRCULATIONS

ESTABLISHED 1887 AND INCORPORATING THE "ELECTRICAL JOURNAL," "JOURNAL OF ELECTRICITY, POWER & GAS" AND "JOURNAL OF ELECTRICITY"

ABP

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883 Mission Street, San Francisco

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Are You an Old-Timer?

NOT that we want to call up harrowing memories, but the San Francisco fire certainly burned us up.

We mean, of course, the San Francisco fire of 1906. You see that fire consumed not only the city but also the record books, files and bound volumes of the Journal of Electricity, Power and Gas, predecessor of ELECTRICAL WEST. That was bad enough at the time, but it's worse now. Because this year ELECTRICAL WEST celebrates its 51st birthday, and when a man reaches that age it's well to put his house in order.

What we want to know is how many of our present subscribers were subscribers before the fire. Were you a subscriber in 1887 to the Pacific Lumberman, Contractor and Electrician? Or in 1895 to the Electrical Journal, which almost immediately became the Journal of Electricity? Or in 1899 to the Journal of Electricity, Power and Gas? If you were we'd like to hear from you, because these magazines were ancestors of ELECTRICAL WEST.

Frankly, we can't name more than three prior-to-the-fire subscribers. But we know three nowhere nearly completes the list. By all conservative estimates there must be twenty-five.

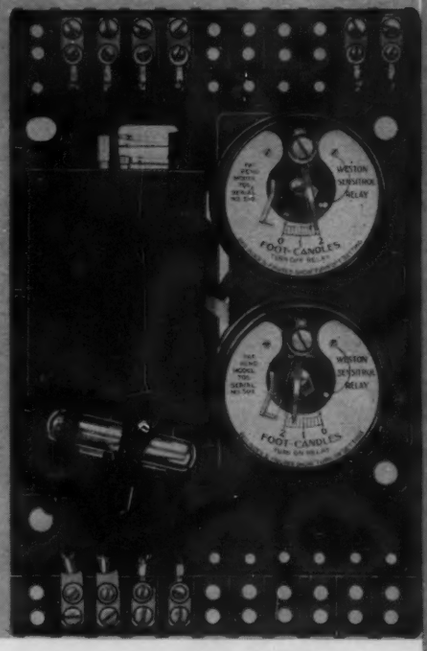
That's a pretty good number for a trade publication to boast. We're proud of it. But, then, you must take into consideration the fact that we are 51 years old; that for fifty-one years we've been recounting the story of the head-over-heels growth of the Western electrical industry; that for fifty-one years we've done everything possible to further the growth of the Western electrical industry. So in view of all the pioneer electrical men still alive and active, we have good reason to wonder.

We're offering no prizes for our oldest subscribers. We're asking only for some information in exchange for all the information we hope we have and know we will continue to bring you.

Are you an old-time subscriber?

HERE'S THE CONTROL THEY USE FOR...

dependable automatic lighting



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The most practical, most economical lighting control unit. The light target used is the small Photronic (photoelectric) Cell, which can be mounted any distance away and easily wired to this compact relay control panel. No amplification used. Separate "on" and "off" relays, calibrated in foot-candles, permit quick and independent setting of both the "on" and "off" illumination values. Uses no energy when not operating; consumes but 2 watts during the brief operating cycle.

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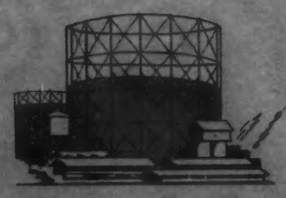

OBSTRUCTION MARKERS

STREET LIGHTING

AIRWAY BEACONS

SIGN LIGHTING

LIGHTHOUSES

Safety at night along our airlanes with automatically controlled airway beacons, as well as automatic safety lights atop gas tanks, radio towers, power plant chimneys and other obstructions on our airways. *Safety* in harbor piloting with friendly and automatic warning lights marking shoals and reefs. And greater safety on our streets . . . economy, too . . . now that street lighting in many of our cities is automatically maintained at safe illumination levels. And wherever else that illumination is the key to safety . . . or to efficiency or economy, such as sign lighting, factory lighting or the like . . . WESTON Photronic Illumination Control invariably is employed. Because the *simplicity* of Photronic Control assures safety, dependability and economy in the highest degree. The WESTON engineer in your vicinity will gladly give you full details on Photronic Illumination Control, as well as on WESTON direct-reading Illumination Meters, and other Photronic devices. Call on him, or write to . . . Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, New Jersey.

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REDUCE YOUR BREAKAGE

WITH O-B HUSKITYPES

Worried now, but he'll smile when he inspects the insulators in this crate—they're Huskitypes. Made especially to minimize breakage, Huskitypes have high impact resistance and great ruggedness. One type, with petticoats, will withstand rough handling and rock throwing. This unit has the excellent mechanical and electrical characteristics of all O-B suspensions—and the same life-prolonging features. Another type, with smooth disc and slightly lower flashover values, is for lines subject to gun fire. If insulator breakage is a problem on your property, install these Huskitypes. They will definitely lower your insulator mortality rate, more than justifying their small extra cost.

2004-H

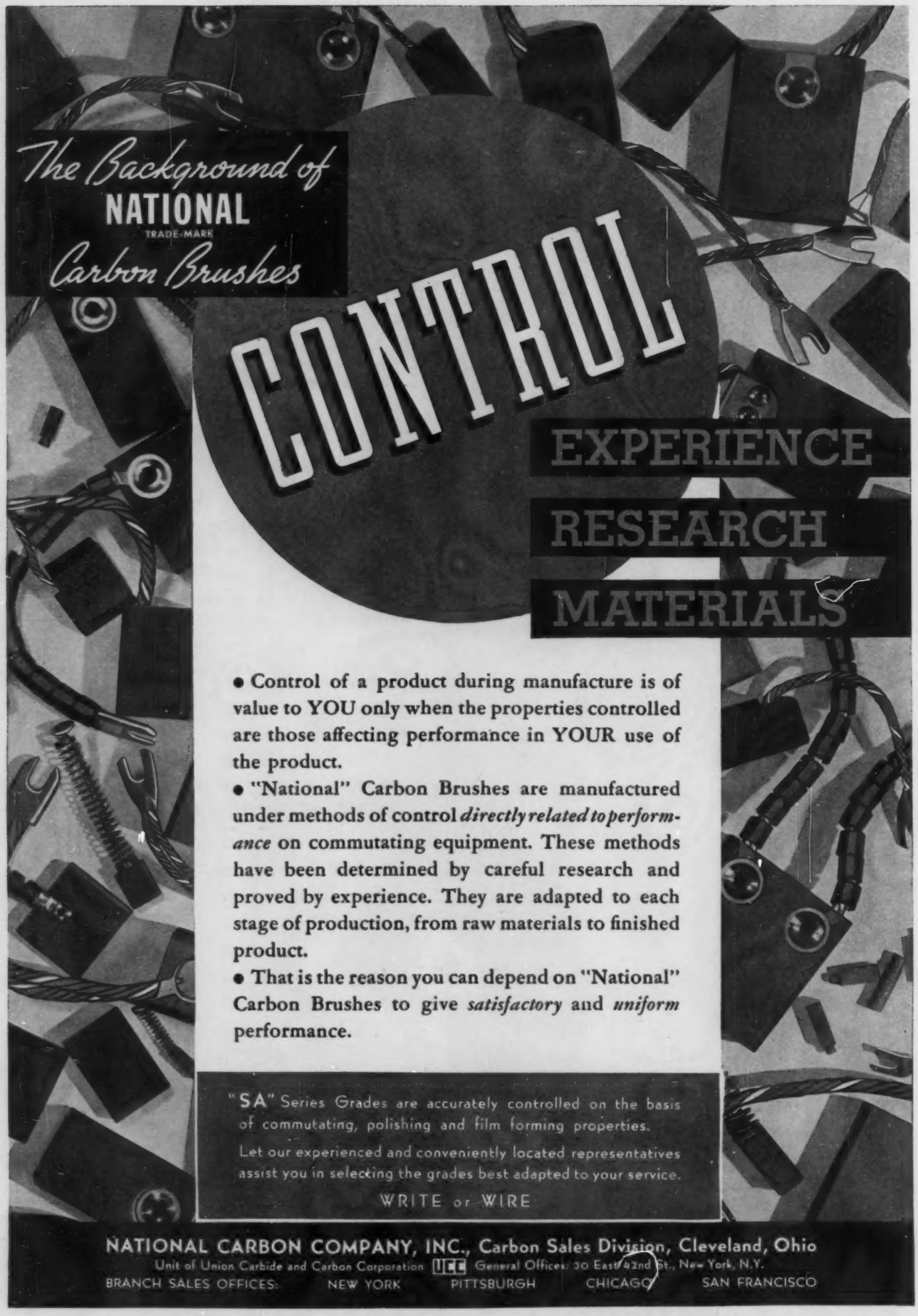
IT COSTS LESS TO USE O-B INSULATORS

OHIO BRASS

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT., CANADA

50 YEARS OF SERVICE
FOUNDED IN 1888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NATIONAL
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• Control of a product during manufacture is of value to YOU only when the properties controlled are those affecting performance in YOUR use of the product.
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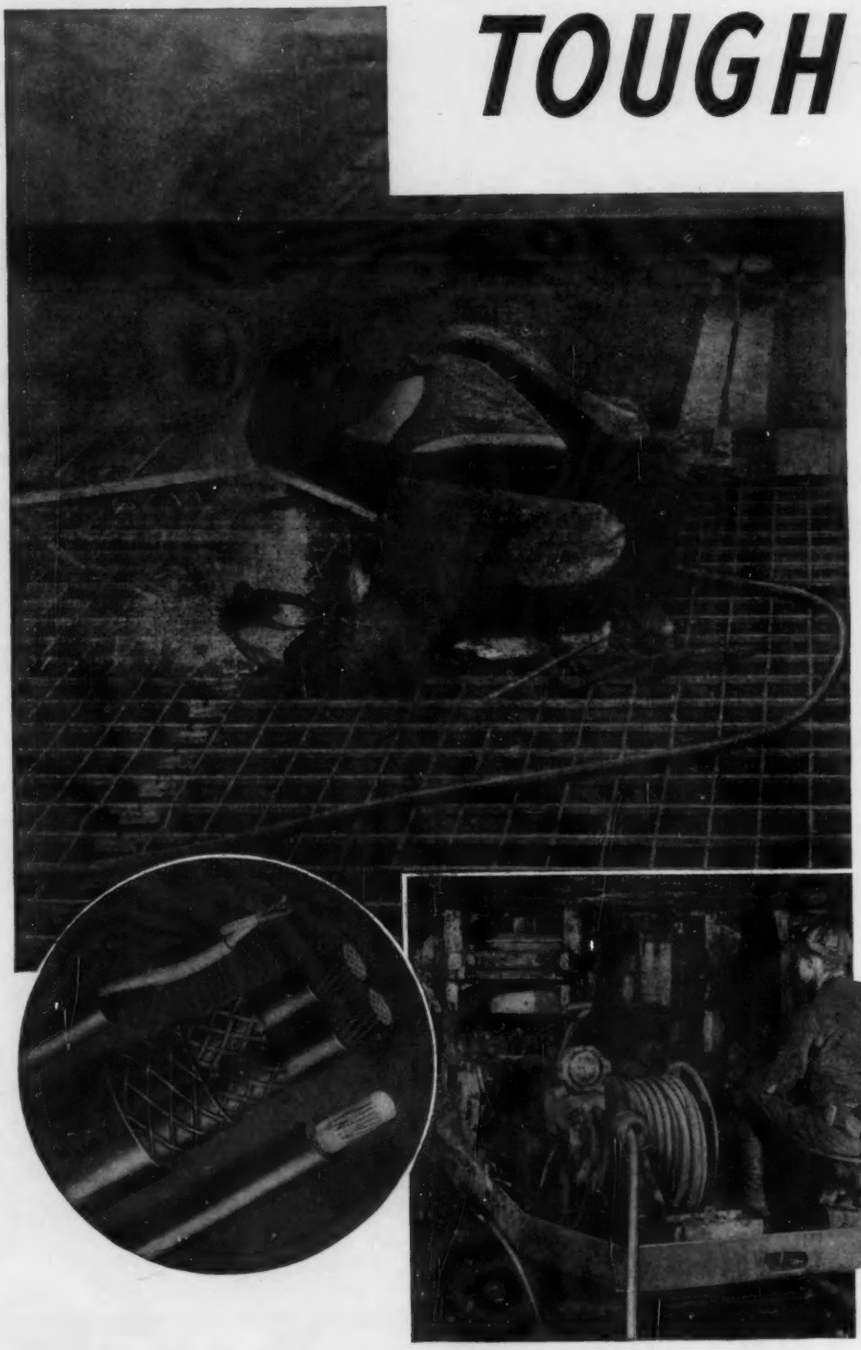
TOUGH *they have to be . . . and* TOUGH *they are!*



IF YOU use electrical Cords and Cables you will find it worth your while to investigate Amerclad All-Rubber Cords and Cables. For whatever your requirements may be you will find that they are within the Amerclad range. You will find, too, that Amerclad All-Rubber Cords and Cables will always meet your electrical needs with complete satisfaction and economy.

Amerclad construction consists of one or more conductors encased in a protective sheath of tough, resilient rubber. It is this tough protective covering that gives added life to Amerclad Cords and Cables. It resists rough treatment, oil, water, and abrasive wear . . . it withstands the rigors of heavy duty which are particularly destructive to portable cords and cables. Yet, with their extra toughness, Amerclad Cords and Cables have the flexibility that makes it possible to move them from place to place with ease.

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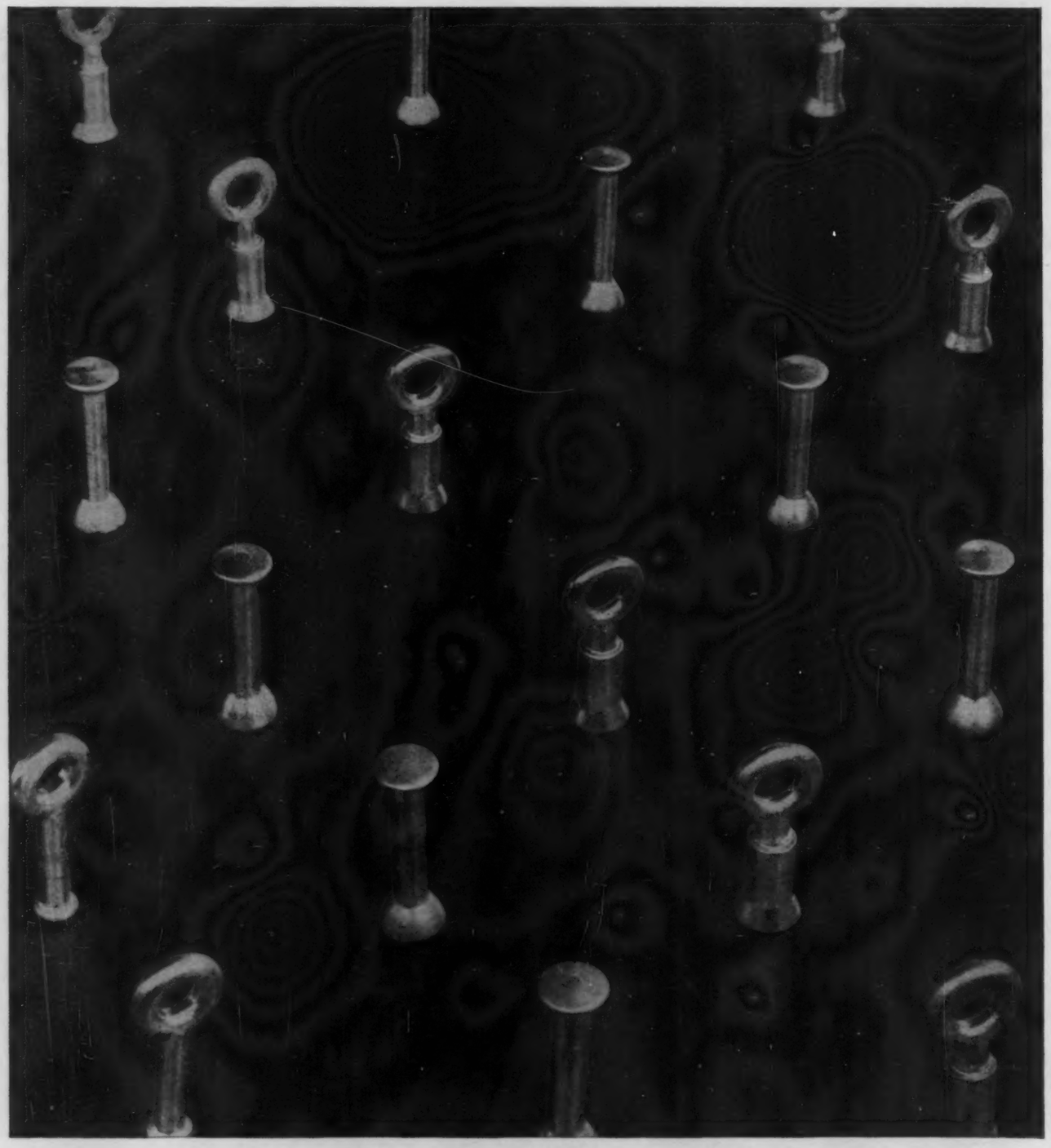
AMERCLAD *All-Rubber* CORDS AND CABLES

COLUMBIA STEEL COMPANY . *San Francisco*

Pacific Coast Distributors of Amerclad Cords and Cables for American Steel & Wire Company

United States Steel Products Company, New York
Export Distributors

UNITED STATES STEEL



Forged to Specifications—Coined One-Step Pins

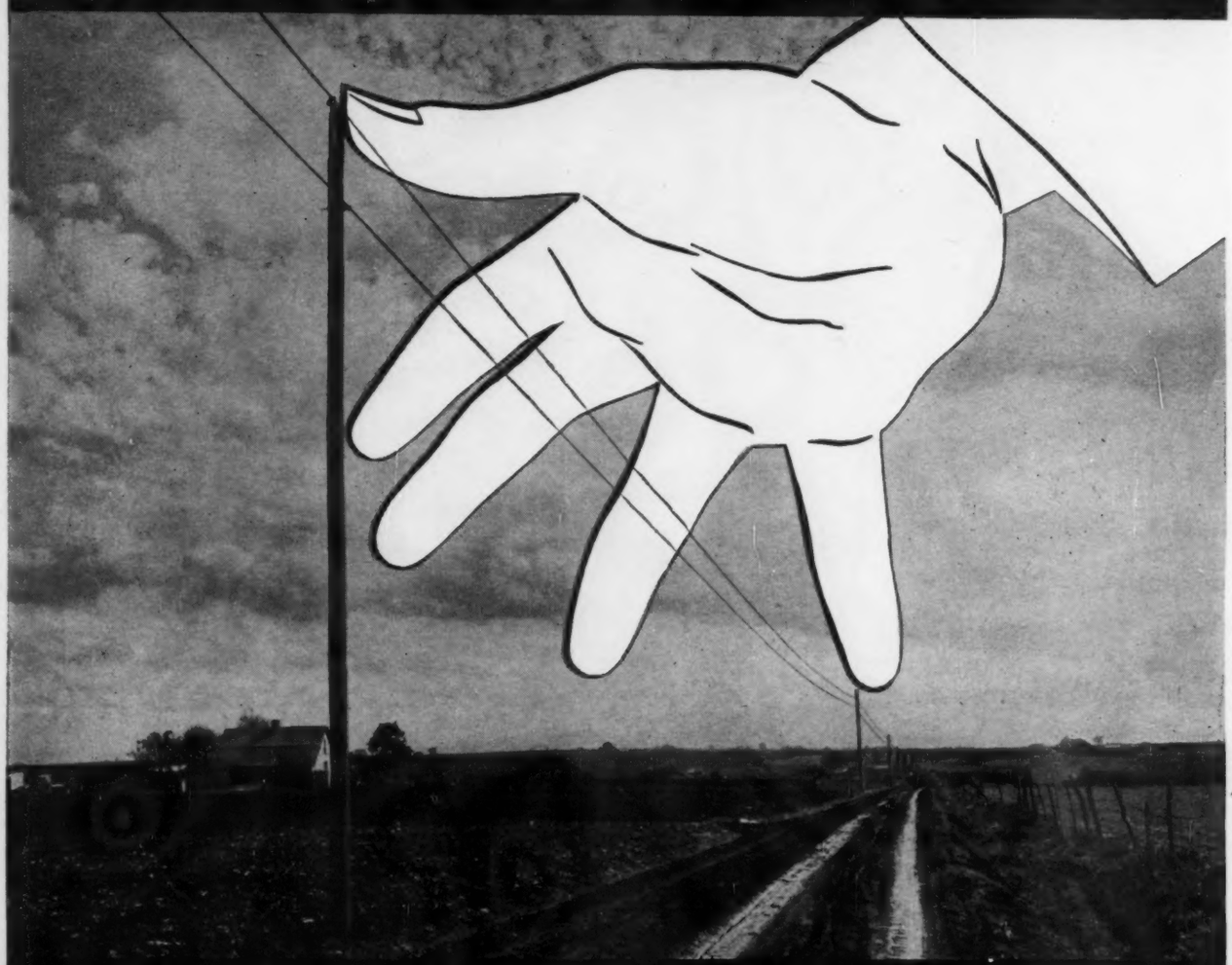
FORGED by B.T.C.

THROUGH YOUR INSULATOR MANUFACTURER ONLY

IF IT'S HI-LINE HARDWARE, B. T. C. CAN FORGE IT

THE BREWER-TITCHENER CORPORATION, CORTLAND, NEW YORK

LONG SPAN... LOW COST



with this efficient *NEW* conductor

Longer spans in rural distribution lines are now practical with this stronger, more efficient conductor. The extra high tensile strength . . . combined with the low electrical resistance . . . of *Crapo* HTC-130 Galvanized Steel Conductors makes possible important savings in line construction and maintenance costs.

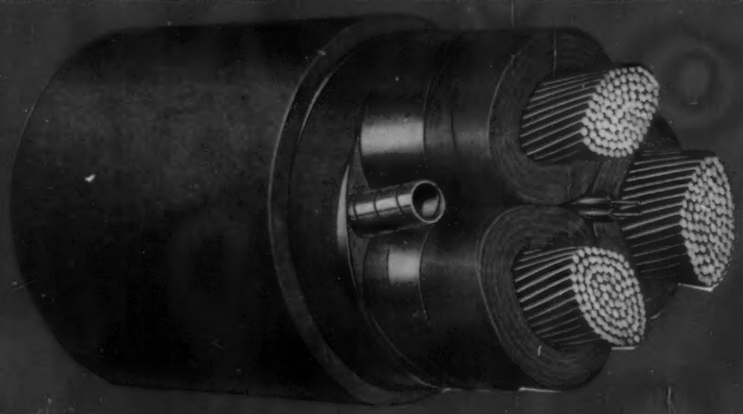
This superior wire of special analysis has been perfected after years of research by Indiana Steel and Wire Company, pioneers in the development of steel conductors . . . *Crapo* HTC-130 Steel Conductors have been "proved in." Thousands of miles are now in service. Complete technical information is available in bulletin form. Write—

Crapo HTC-130 STEEL CONDUCTORS

For Rural Distribution Lines
Solid and Three Wire

INDIANA STEEL & WIRE CO.
Muncie, Indiana
Manufacturers of
Crapo Galvanized Steel Conductors,
Steel Strand, Telephone and Telegraph Wire.

OKONITE-CALLENDER



OIL-FILLED

Paper-Insulated Cables

Okonite-Callender oil-filled cable provides an economical means of solving many problems that arise in operating high-voltage, underground systems.

Among the important advantages of oil-filled cable are:

Smaller outside diameters
Greater insulation stability
Greater allowable current carrying capacity

It is recommended that oil-filled cable be given consideration in plant problems involving high-voltage, underground cables. We offer an active, practical engineering service for assistance in such studies. Our bulletin on oil-filled, paper insulated cables will be mailed upon request.

1938 Marks Our 60th Year of Service

THE OKONITE COMPANY

Founded 1878

EXECUTIVE OFFICE: PASSAIC, NEW JERSEY

HAZARD INSULATED WIRE WORKS DIVISION — THE OKONITE-CALLENDER CABLE CO., INC.

New York Boston Seattle Buffalo Chicago Dallas Detroit Atlanta
Philadelphia Los Angeles Pittsburgh St. Louis Washington San Francisco

OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

INDICATING SECONDARY FUSE

OUTDOOR TYPE

FOR LOW-COST FAULT ISOLATION

YOU can improve service three ways with the new low-cost indicating secondary fuse.

1. Reduce light flicker by using them for banking of transformer secondaries.
2. Protect transformers from secondary faults by installing them in the secondary leads of transformers.
3. Isolate service-entrance faults by placing them on branch circuits.

The new secondary fuse is so low in first cost that it can be profitably applied on hundreds of secondary circuits where more elaborate protective devices are not economically justified.

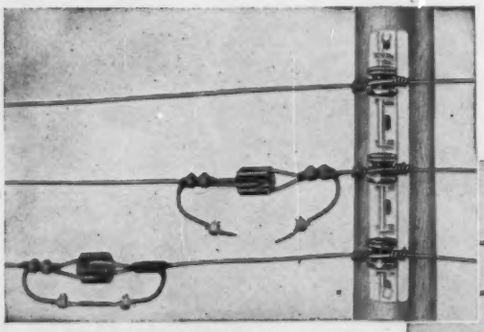
RELIABLE OPERATION

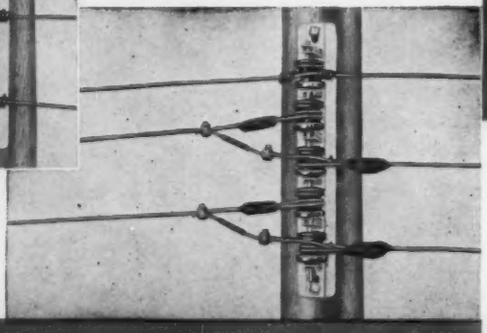
The new G-E secondary fuse has built into it the unexcelled accuracy of all General Electric fuse links, with characteristics based on actual test data, permitting accurate co-ordination of the fuse links with motor-starting currents, with primary or secondary fuse links of other ratings, and with relays. The *fusible element is totally enclosed* in the Textolite tube for protection against weather and to provide permanence of characteristics. A stainless-steel spring assures positive expulsion and indicating action on low overload currents as well as short-circuit currents.

It will pay you to investigate the possibilities of improving service at low cost with this new G-E fuse.

FREE SAMPLE FUSE FOR YOUR INSPECTION

To enable every distribution engineer to see the new G-E secondary fuse without delay, we are offering you the opportunity to obtain a 5-ampere fuse immediately and without cost to you. Get this sample fuse — look it over — note the weatherproof construction — then test it. See for yourself that it gives positive indication even on low overloads. Ask for your sample now. Use the coupon or write on your business stationery. Address General Electric, Dept. 6—201, Schenectady, New York.

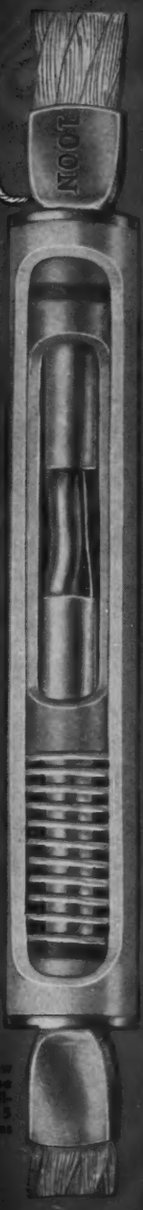




TWO WAYS TO INSTALL

(Left) Where strain insulators are used, the fuse can be installed this way (upper fuse shown indicating)

(Right) The fuse can be installed at the pole without the use of strain insulators



Cutaway view of the new G-E indicating-type secondary fuse. Available in ratings from 5 amperes to 200 amperes inclusive

Send for

FREE SAMPLE

OFFER EXPIRES SEPT. 1, 1938

GENERAL ELECTRIC

General Electric, Dept. 6Z-201
Schenectady, N. Y.

Please send me by return mail free sample of the 5-amp G-E secondary fuse for low-cost protection of secondary circuits. Also descriptive and application bulletin GEA-2942.

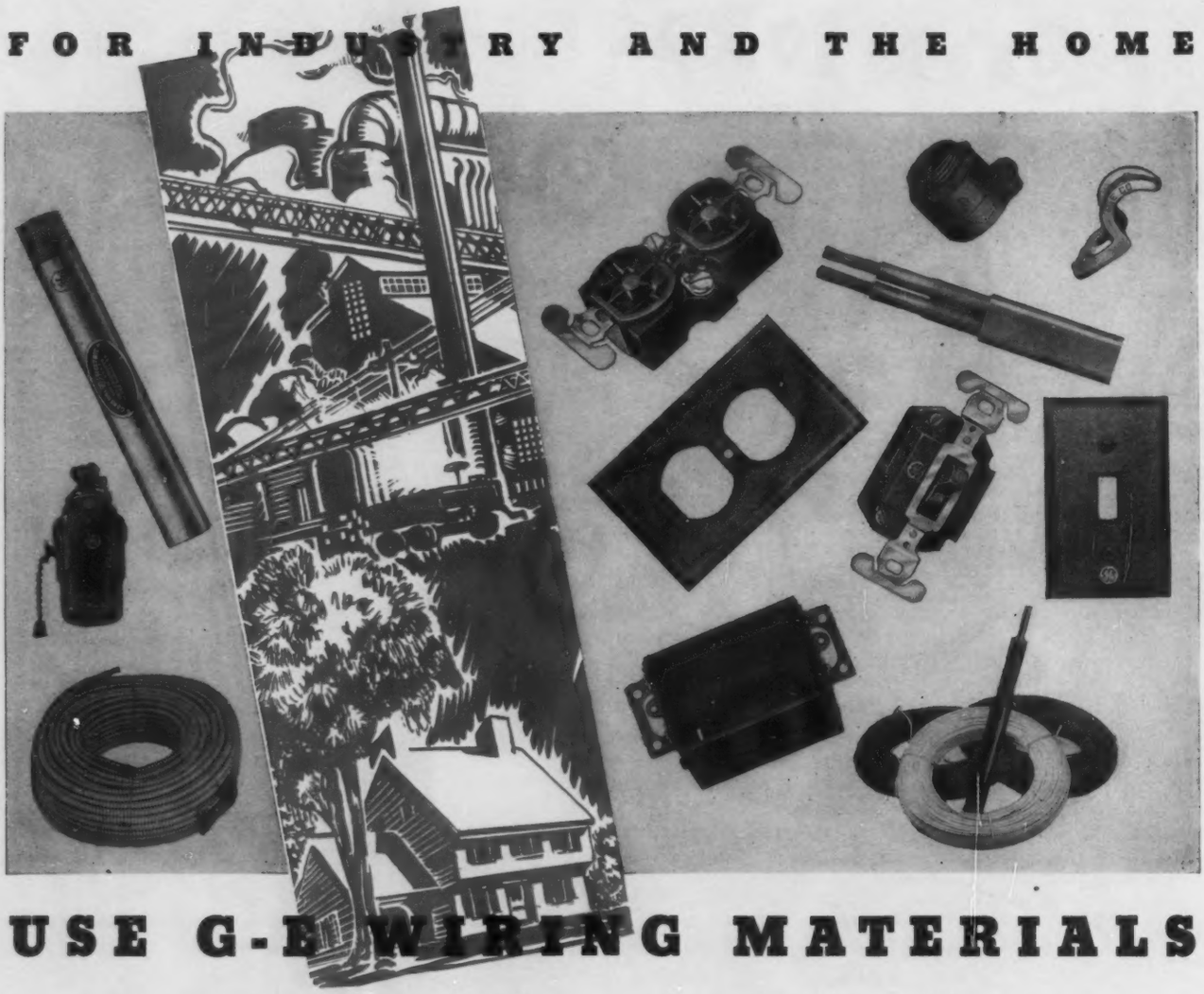
Name.....

Firm.....

Address.....

City..... State..... 340-37

FOR INDUSTRY AND THE HOME



USE G-E WIRING MATERIALS

For adequate wiring in industry and the home, use G-E Wiring Materials. The long-established G-E line is famous for its uniform high quality, good design and enduring service. You can always get the right conduit, wire and cable and wiring devices to satisfy your electrical requirements.

Use G-E Wiring Materials for new wiring and for modernization work. They reduce maintenance costs in factories and commercial buildings, and promote full comfort and electrical convenience when used in wiring systems planned for apartment houses and homes.

The G-E line includes: White Rigid Conduit, Boxes and Fittings, Fiberduct for Underfloor Wiring, "BX" Armored Cable, Service Entrance Cable, Building Wire, Braided and Rubber-covered Cords, Branch-circuit Circuit Breakers, Fuses, Switches, Plates, Lampholders, Outlets, Plugs and Cord Sets.

Get complete information from your nearest General Electric Merchandise Distributor, or write to Section CDW-8211, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC
WIRING MATERIALS

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

We'll Send You FREE

A KEARNEY *(PATENTED)* INDICATING SECONDARY FUSE

features OF THE KEARNEY FUSE

Outer tube made of sturdy weather-resistant Bakelite of proper strength and thickness.

Corrosive-resistant stainless steel spring actuates separation of line when open is made.

The inner tube is made of fibre to give satisfactory arc extinguishing properties.

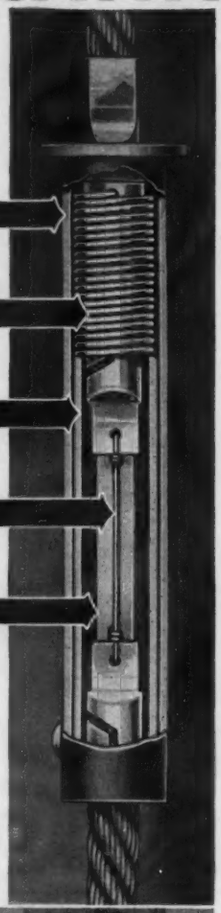
The strain wire used in this fuse is Nichrome V and gives desired strength.

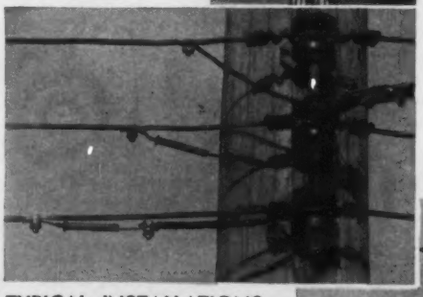
Fusible Elements of pure tin give durability at normal loads—accurate low temperature at abnormal loads.

Performance characteristics same as specified in N.E.M.A. 100% basis rating.

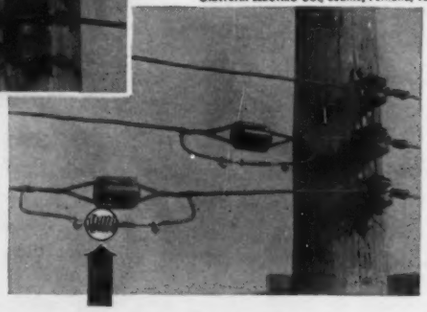
Current characteristics are similar to Kearney Quik-Action Fuse Links.

PATENT No.
2111745
2108843





TYPICAL INSTALLATIONS
Above—Kearney Secondary Fuses installed at the pole—a neat, workmanlike installation that does not require use of strain insulators.



INDICATING A BLOWN FUSE
Above—Shows Kearney Secondary Fuses used in connection with strain insulators . . . Note the one fuse which has blown is in indicating position, denoting that there has been trouble.

Test It Any Way You See Fit

SEE FOR YOURSELF how you can improve service and create better customer good will, at low cost, with these time-tested, patented Kearney Indicating Secondary Fuses . . . note how you can inexpensively place them on branch circuits to isolate service entrance faults . . . protect transformers from secondary faults, by using them in secondary leads of transformers . . . minimize light flicker by installing them for banking of transformer secondaries.

Try them on those secondary circuits which you know should be protected, but aren't, because of excessive cost of more elaborate and expensive protective equipment . . . Kearney Indicating Secondary Fuses have a number of exclusive and patented features which make them the choice of scores of thrifty operating men.

They indicate clearly in the blown position, as shown in the illustration . . . no dangling ends to come in contact with other conductors . . . they have an outer bakelite tube that resists weathering, inner fibre tube gives arc extinguishing properties . . . stainless steel spring actuates separation of line on an open . . . Nichrome V strain wire affords strength . . . pure tin fusible elements give durability at normal loads — accurate, low temperature melting at abnormal loads.

But take advantage of this opportunity to investigate the service and money-saving features of Kearney Indicating Secondary Fuses. Fill in the attached coupon now . . . before the offer expires . . . or write for sample on your company stationery.

Exclusive Sales Representatives

MAYDWELL & HARTZELL
INCORPORATED
LOS ANGELES • SAN FRANCISCO • PORTLAND

EXCLUSIVE DISTRIBUTORS
GRAYBAR ELECTRIC CO., Seattle, Portland, Tacoma, Spokane • WESTINGHOUSE ELECTRIC SUPPLY CO., Phoenix • J. R. BRADLEY CO., Reno

FREE OFFER *Expires August 31*

JAMES R. KEARNEY CORPORATION, Fuse Dept. 2, 4224-42 Clayton Avenue, St. Louis, Missouri

Please send me, without obligation, one (1) free sample 5-amp. patented Kearney Indicating Secondary Fuse for low-cost fault isolation.

Name.....

Company.....

Address.....

City..... State.....

M-H

THE BIG 3 OF *insulation!*

3 SIZES

TYPE 660 . . . FOR VOLTAGES UP TO 8,000
TYPE 670 . . . FOR VOLTAGES UP TO 10,000
TYPE 680 . . . FOR VOLTAGES UP TO 15,000
Handle most PRIMARY line requirements

■ On line after line they're going up! The three great HEMINGRAYS! They're *tough;* age doesn't mark them. They're *strong;* they defy rigorous service. They're *versatile;* efficiency remains constant. They're *economical;* they reduce initial and over-all costs to a minimum. They're *competent;* they overcome outage loss. All in all, these great new HEMINGRAY Glass, brass-bushed insulators provide a life of better insulator service than has ever been known before. Send for samples—subject them to the most gruelling tests—then watch them *deliver.* Owens-Illinois Glass Company, Hemingray Division, Muncie, Ind.

World's largest manufacturers of glass containers; and producers of INSULUX Glass Block, DUST-STOP Replacement-Type Air Filters, FIBERGLAS Insulating Wool, Insulating Blankets and Electrical Insulation.

HEMINGRAY INSULATORS

OWENS-ILLINOIS GLASS COMPANY

"First in Glass"

RUPTORS QUENCH ARCS *FAST!*

Their "QUICK-QUENCH" Action CUTS Oil Carbonization and Contact Deterioration to a Minimum!

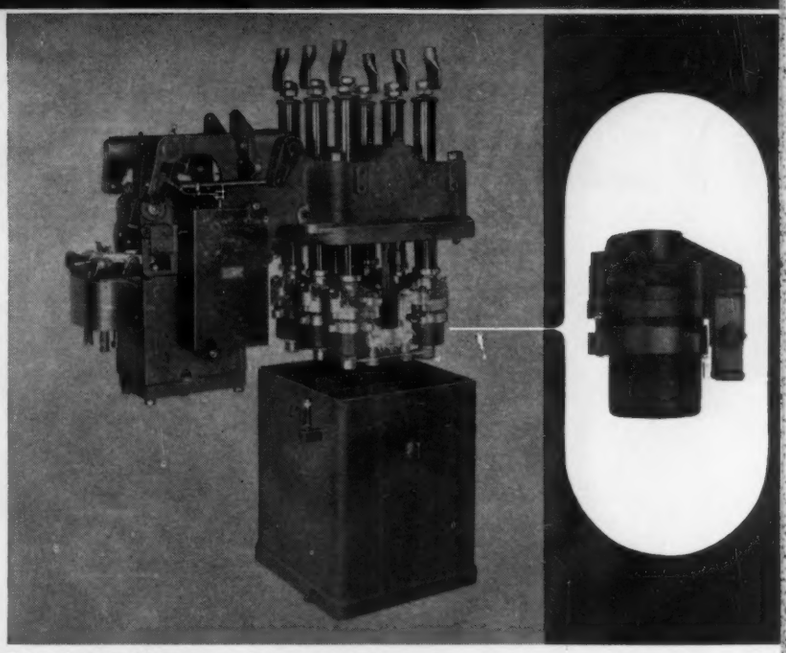
● When a short circuit occurs, it's got to be interrupted in a hurry! That's the *why* of the oil circuit breaker. That's what you get in Allis-Chalmers Oil Circuit Breakers with Ruptors, for high voltage systems.

For Ruptors snuff out arcs . . . *fast*! And their "QUICK-QUENCH" action means that oil carbonization is lessened and contact replacements are reduced . . . that high maintenance and inspection costs are actually cut to a minimum!

Consistent Operation Without Constant Attention!

You get consistent operation without constant attention. Ruptors enable an oil circuit breaker to handle many more circuit interruptions before requiring inspection and renewal of oil and contacts. And when service is necessary, it's a quick and easy job! Ruptors are accessible for inspection and testing . . . take less time to service than other circuit breakers.

But that's not all you get when you install Allis-Chalmers Oil Circuit Breakers. You get the advantages of Allis-Chalmers experience in engineering. You benefit by the technical research continually in progress in the Allis-Chalmers laboratories and in those of associated companies throughout the world.



LABORATORY AND FIELD TESTS prove that Ruptors increase circuit interrupting efficiency. Shown here is a Type DZ-40, 3 pole, 600 amp, 15 kv oil circuit breaker with Ruptor.

Get the whole story. Find out how "QUICK-QUENCH" action can serve you. Let your Allis-Chalmers representative, in the district office near you, show you how to get higher interrupting capacities . . . how to get lower maintenance costs!

SWITCHGEAR DIVISION

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

METALCLAD SWITCHGEAR • SWITCHBOARDS • OIL CIRCUIT BREAKERS • REGULATORS • MOTOR STARTERS • CUBICLES • SWITCH HOUSES

The Jobs you READ about
GOLDEN GATE BRIDGE
Spanning San Francisco's Great Harbor.
TRIANGLE CONDUIT ON THE WORLD'S LARGEST AND LONGEST SUSPENSION BRIDGE
A Triangle Product rewards the Buyer
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
Pacific Coast Division
C. C. Hills, Vice-President in Charge of Sales
390 Seventh St. San Francisco
NEXT ISSUE
TRIBORO BRIDGE
Connecting three boroughs of Manhattan
It MUST be right!

The Jobs you READ about
TRIBORO BRIDGE
Connecting three Boroughs of NEW YORK CITY
TRIANGLE CONDUIT
SELECTED AGAIN!
TO SERVE SEVERE REQUIREMENTS
A Triangle Product Rewards the Buyer!
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding & Queens Blvd.
ELMHURST, NEW YORK CITY, N.Y.
NEXT ISSUE
The FIRST Building of the New York World's Fair
It MUST be right!

CONCLUSIVE PROOF THAT

A "sum-up" of Triangle advertisements that have appeared in

The Jobs you READ about
This FIRST
U. S. HOUSING PROJECT
"TECHWOOD" AT ATLANTA, GA.
USING
TRIANGLE ELECTRIC METALLIC THIN WALL CONDUIT
... and here's why many others followed
EASIER TO WORK
(Quick to cut, bend, ream and couple)
EASIER TO FISH
(An inside finish that's as smooth as a gun barrel)
DEFIES CORROSION
(Hot galvanized—inside and outside)
TRIANGLE PRODUCTS REWARD BUYERS!
TRIANGLE CONDUIT & CABLE CO., Inc
Horace Harding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
NEXT ISSUE
WEST SIDE EXPRESS HIGHWAY NEW YORK CITY
It MUST be right!

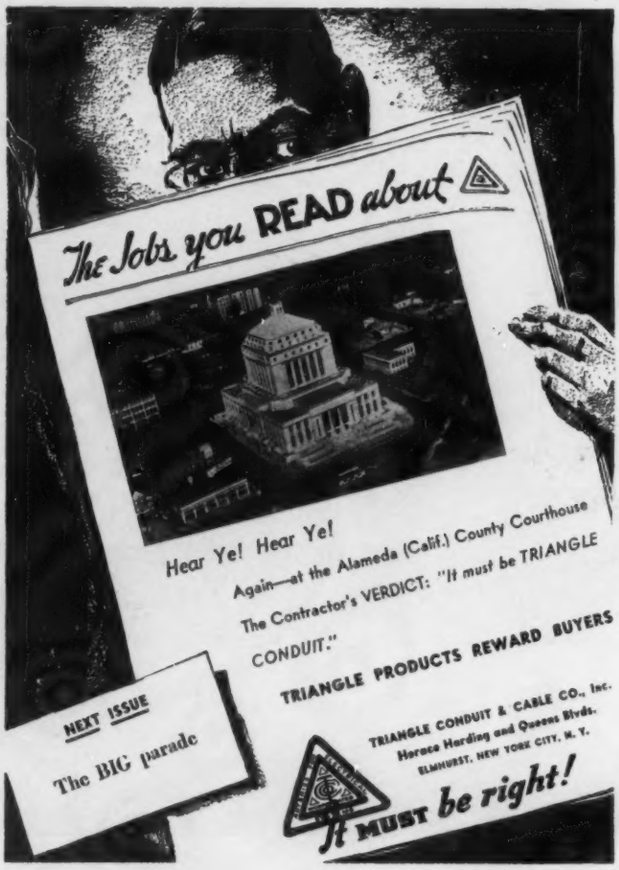
The Jobs you READ about
West Side Express Highway New York City
FOR SAFE ARTERIES
of Traffic—or Electricity!
Another job on which THE CONTRACTOR WAS SAFE because HE SPECIFIED TRIANGLE
TRIANGLE PRODUCTS REWARD BUYERS!
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
NEXT ISSUE
ALAMEDA COUNTY COURTHOUSE OAKLAND, CALIF.
It MUST be right!

The Jobs you READ about
THE ADMINISTRATION BUILDING
TRIANGLE PRODUCTS exclusively in the FIRST building of the NEW YORK WORLD'S FAIR 1939
FIRST TO LAST
Triangle products Reward Buyers!
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding & Queens Blvds.
ELMHURST, NEW YORK CITY, N.Y.
NEXT ISSUE
Metro-Goldwyn-Mayer Production Studio
It MUST be right!

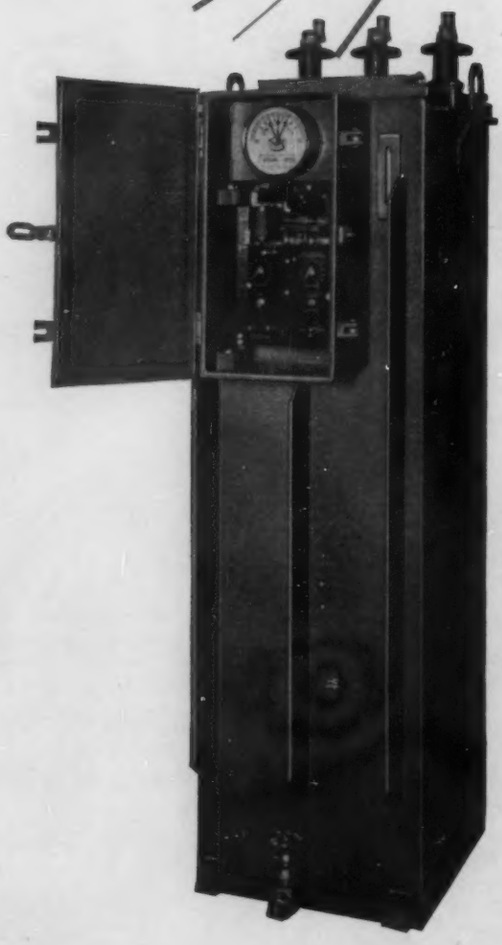
The Jobs you READ about
A FIVE STAR FEATURE!
JEANETTE MacDONALD . . . NELSON EDDY . . . and . . .
TRIANGLE CONDUIT, WIRE AND CABLE
TRIANGLE PRODUCTS REWARD BUYERS!
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
NEXT ISSUE
TECHWOOD U. S. HOUSING PROJECT
ATLANTA, GA.
E. M. T. THIN WALL
CONDUIT INSTALLATION
It MUST be right!

"TRIANGLE PRODUCTS REWARD BUYERS"

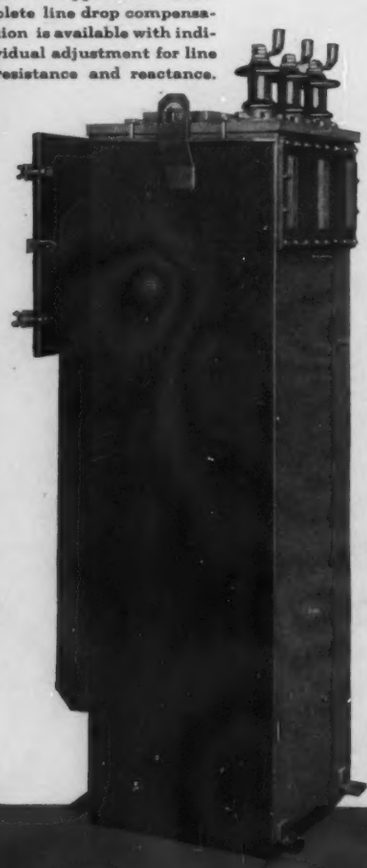
Electrical Contracting, The Wholesaler's Salesman, and Electrical West


The Jobs you READ about
Hear Ye! Hear Ye!
Again—at the Alameda (Calif.) County Courthouse
The Contractor's VERDICT: "It must be TRIANGLE CONDUIT."
TRIANGLE PRODUCTS REWARD BUYERS
TRIANGLE CONDUIT & CABLE CO., Inc.
Horace Harding and Queens Blvds.
ELMHURST, NEW YORK CITY, N. Y.
NEXT ISSUE
The BIG parade
It MUST be right!

Now! You can have



Note the simplicity of the control apparatus. Complete line drop compensation is available with individual adjustment for line resistance and reactance.



Operating mechanism is completely oil-immersed, protecting it against moisture and dust, greatly reducing maintenance.

Westinghouse

Feeder Voltage Regulation

WITHOUT BREAKING THE BANK

Westinghouse offers low-cost correction with the type SU Induction Voltage Regulator

Low first cost and low maintenance costs, with assurance of long life . . . these were the aims accomplished by Westinghouse engineers in designing the Type SU Induction Feeder Voltage Regulator. This new, low-priced equipment will enable you to obtain exacting voltage regulation on feeders where revenues are limited.

A design suitable for all classes of service, indoor or outdoor, permits a high degree of standardization. Simplification of the structural design and an increased use of welding made savings possible in the fabrication of the Type SU Regulator. The same high standards for materials, workmanship and testing were adhered to, with the result that, although selling for less than previous models, even better performance can be expected.

Type SU Regulators require very little attention

Operating on the transformer principle, the Type SU Induction Feeder Voltage Regulator provides smooth regulation. The newly designed control relay, with but one moving part supported on two husky bearings, is positive in action. Operating parts are completely oil-immersed, protecting them against moisture and dust; control mechanism is in a weather-proof cabinet. All of these factors combine to give long life, with a minimum of maintenance.

Installation is easy

The Type SU Regulator is used for correcting voltages on single-phase feeders or, in banks on polyphase feeders; 2400 and 4160 volts, 150 to 500 amperes, and 4800 volts, 75 to 250 amperes. It is completely self-contained and, to install, it is only necessary to connect the three main terminals to the line. Though extremely sensitive in operation, it requires no extra care in handling; can be removed readily from one location to another as conditions change.

A booklet, B-2165, describing Westinghouse Type SU Induction Feeder Regulators, is yours for the asking. Write to: Westinghouse Electric & Manufacturing Company, Room 7-N, East Pittsburgh, Pa.

J 16084

Type SU INDUCTION FEEDER VOLTAGE REGULATORS

C·S·P Means no more Burnouts from Short Circuits

The CSP Transformer provides complete protection against destructive short circuits.

Secondary wires may become crossed and cause a high short circuit current . . . or become grounded through a high resistance. In either case, the CSP Transformer is protected from burnouts. This factor, among others, is why the CSP gives you the lowest operating cost. Ask your Westinghouse representative for complete information or write for booklet 2042-A, Westinghouse Electric & Manufacturing Company, Department 7-N, East Pittsburgh, Pa.

ONLY C·S·P TRANSFORMERS ARE:

1. Completely Self Protected against lightning — no fuses to replace.
2. Completely Self Protected against burnouts from short circuits.
3. Completely Self Protected against burnouts from overloads.

PLUS

4. Simple, low-cost installation; maintenance expense low after installation.

J-70123

Westinghouse

Completely SELF PROTECTING TRANSFORMERS

—and what it means to you

THE copper thickness on Copperweld wire is accurately measured and guaranteed. It must be not less than 12½ per cent of the wire radius of 40 per cent conductivity wire, and not less than 10 per cent of the wire radius of 30 per cent conductivity wire.

That means long life, freedom from rusting and lowered maintenance costs, when you use Copperweld wire or strand for guys, messenger cable, overhead ground wire, telephone wire, signal line wire, rail bonds, fence, etc.

It means that Copperweld can be clamped, bent, served, twisted or spliced without injury to the thick protective covering of welded-on copper.

You can have all the advantages of Copperweld's guaranteed copper thickness and permanent high strength for surprisingly little. Seldom does the use of Copperweld add more than a few per cent to the total cost of the job.

You are invited to write for a copy of Specification BW35, which includes complete specifications and guarantee.

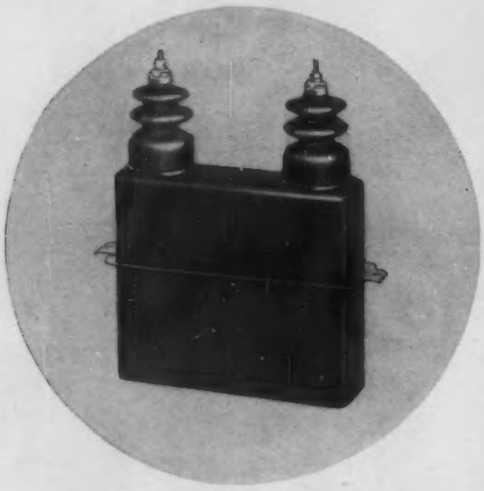
COPPERWELD STEEL COMPANY

Glassport, Pa.

COPPER · BRONZE · COPPERWELD RODS, WIRE, AND STRAND

WORLD'S TYPING CHAMPION*
99 63/100% Perfect Score

*George L. Horsfield, of West Englewood, N. J., who won the world's typing championship in open competition last August by typing 8,656 words in a single hour with only 31 errors—an average of more than 139 words per minute



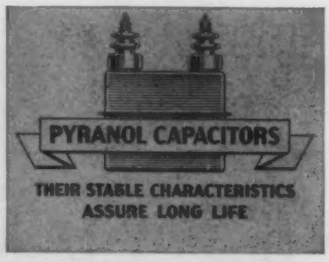
PYRANOL CAPACITORS
99 85/100% OPERATING RECORD

PYRANOL capacitors are champions of dependability, ready to add capacity to your heavily loaded circuits without adding to your maintenance expenses.

Dependability has been achieved in part by careful control—control of the materials, control of the manufacture. For example, during the important treating processes, the vacuum and temperature are checked constantly in order to give a uniformly high-quality product. All the materials—even those like the paper dielectric and aluminum foil, which are not made by General Electric—must be manufactured to General Electric's exact specifications.

Periodic check of temperature and vacuum during treating processes.

The service record of G-E Pyranol capacitors is an accurate measure of the reliability which has been built into these units by careful control. And it is also an accurate indication of how reliably they can operate for *you*. Remember Pyranol capacitors when you are considering ways of releasing system capacity. They are inexpensive, easy to install, and reliable. General Electric, Schenectady, N. Y.



GENERAL ELECTRIC

80-139

ELECTRA'S HUSBAND

Noise vs. Death in the Kitchen

WE WERE in the breakfast nook having our toast and orange juice. Relative quiet prevailed; there was an occasional honk from a passing car and now and then the pup next door let out a yip. Otherwise it was a peaceful California morning.

Suddenly Electra exclaimed, "What was that?"

"What?" I inquired.

"That terrible racket. It sounds like one of those outfits they use to tear up the streets."

"I didn't hear anything," I said meekly.

"You must be deaf. There it goes again—it's right here in this part of the house—put down your paper and listen! It sounds like some one pounding on the pipes."

I was sympathetic, but I declare I could not hear anything unusual. After a bit, whatever it was stopped, and Electra appeared more at ease. We finished breakfast and I left for the office. When I arrived, the girl said, "Call your home—right away."

I did, and found Electra in a turmoil. "I've located that awful racket," she said. "It's the refrigerator. What shall I do?"

It was evident that I had a problem on my hands. "Just turn it off and I'll send a man out to investigate."

Instead of calling the refrigerator folks, I phoned Dr. Brown and related the incident. He seemed to grasp the situation at once.

"I've had several cases like that recently," he said. "It's a mild nervous disorder and it comes from reading those ads that the gas companies have been putting out lately. I see them everywhere — in newspapers, in magazines, on the billboards — even hear it on the radio. Does your wife read the ads?"

"All of them. We've talked about them lots of times."

"Well, there you are," the doctor said. "That's the root of your trouble. There was one ad showing a boy making a racket with a hammer while his mother commented, 'I like noisy children, but I can't stand a noisy refrigerator.' There was a whole series like that. Your wife is naturally sensitive and it's got to the point that whenever she hears a slight hum in the kitchen she thinks of the kid with a hammer or some other picture she has seen in the ads and the sound is magnified until she is in real distress. I'll go out and see her at once."

An hour later Dr. Brown phoned that she was all right, that he'd had a long talk with her and for me not to worry. Noon came and I went to the Ad Club. Sat next to Bill Parsons of Parsons, Peters, Burton & Boscoe. Here was my chance.

"Say, Parsons, what's your scheme in these new ads about gas refrigerators—you know, silent as the Maine woods while the electric evidently is a cross between the ferry building at five o'clock and an American Legion drum corps? Can't you sell your damned gas boxes without knocking the other brands? It isn't legal!"

"Oh, yes it is," he said between bites of cold chicken. "Anything is legal that sells goods. It's what we call the scare system."

"The scare system?" I countered.

"Sure," he said. "It's the latest style. You scare people into thinking they are going to have a front tire blowout on their next trip. Or you make a man think he will lose his job because of bad breath—or a girl think she can't go to the party because she smells bad —or the housewife think she'll go crazy unless she gets rid of her noisy refrigerator. It's the modern method, my boy."

"And it's legal?"

"Of course it's legal. Why do you ask a fool question like that?"

"I just wanted to be sure," I said. "Right after the program I'm going over to a friend of mine who's in the electrical business in a big way. I'm going to outline an advertising campaign built around gas explosions and asphyxiation. We can support it with thousands of newspaper clippings. We can get hundreds of photographs. The theme will be DEATH IN THE KITCHEN. And our radio programs will have sound effects of shrieks and cries and explosions and people gasping for breath. Boy, will that be a honey!"

Parsons was speechless for a moment. Then he said, "But you can't do that."

"Why can't we do it?"

"Because it wouldn't be ethical."

And I must agree with him. It wouldn't be ethical.

THE other night a friend of ours told a little story about the New Deal's uplifting of the working man. I've been thinking about it ever since.

For years, he said, the turtle has been going round with its eyes to the ground. With its nose down low it can see only in its immediate circle, and what it looks upon is just the earth. Birds, on the other hand, have wings and can fly round and see everything.

Now our President steps in, takes pity on the turtle and his low horizon and turns him upside down. Naturally the turtle looks up and sees what the birds are doing and he is very dissatisfied. He wants to do as the birds do. But the trouble is that all the President has done is to turn the turtle upside down—he hasn't provided it with wings.

ELECTRA laughed when she heard George Creel, Democratic pooh-bah in California, twit San Francisco's Mayor Rossi about having the "seven-year Ickes," on the radio program from Treasure Island. But she agrees with me that Mr. Secretary Ickes' refusal to allot San Francisco any PWA funds until it gives assurance of doing something about Hetch Hetchy power is the baldest example of centralized bureaucratic interference in local affairs that ever came out of the national capitol. Six times the voters have turned down public ownership. Yet Mr. Ickes says "municipal operation or else."

"Who does he think he is?" Electra asks.

That's what a lot of people would like to know.

The Industry's Stumbling Block?

Not so, says the author. Adequate wiring is only an outcropping indicative of huge hidden resources for all. But we can't tap those resources till we sell the public

By L. B. JOHNSON
General Electric Co.
Salt Lake City

ALL branches of the electrical industry are becoming interested in the subject of adequate wiring. Appliance manufacturers are finding that their market is restricted by the lack of outlets. Utilities find dissatisfied customers complaining of their appliances' operation and thousands of idle appliances on their shelves.

Wholesalers are affected by this restricted market, while dealers find that almost every time they sell a major appliance they must sell an outlet wiring job with it. In order to sell a lighting fixture installation the contractor has to sell a complete rewiring job. And so it goes. Even the public is grumbling about trailing cords, inconvenient outlets and "not enough outlets."

The problem is two-fold: First, always mindful of the future, we must provide adequate wiring in the new homes and commercial institutions that are being built today. Second, we must attempt the modernization or rewiring of the many homes and stores that are now wired so inadequately and usually with no provision for the future.

There are four main markets for better wiring: industrial, commercial, rural and residential.

The Residential Market

The residential field, to which space requirements limit this paper, is in a more deplorable condition than the others. It offers greater possibilities for expansion and is generally recognized as the most promising load-development field for the utility industry. The present lack of adequate wiring in homes is costing the consumer many dollars a year. This loss is caused by the "narrow restricted lanes" through which the utility is trying to deliver the product it has to sell. The utilities spend thousands of dollars to bring proper voltage to the building. Beyond the meter, on the customer's premises, is where the loss occurs.

This loss is composed of two parts—first, the loss in electrical pressure from the meter to the appliance outlet. In old homes where such heavy-duty appliances as the 1,000-watt iron, the 1,320-watt ironer, the 1,500-watt roaster and the 200-300-500-watt IES lamps are operating there is often a 10-per cent voltage drop.

But this loss is only the smaller part of the loss to the public. The manufacturers of these devices design them to operate on standard voltages at maximum efficiency; but on low voltage they drop rapidly in efficiency. The customer must use them longer to get the same work done. And all the time the meter is running.

Heating devices, for example, operated at a lower-than-rated voltage show an increase in time far out of proportion to the voltage drop and will consume additional electric current. Heating devices of the radiant type show losses even greater than those of the conduction type.

While Mazda lamps will light and burn with low voltage, the customer pays for a great many kw.-hr. for which he could get much more light without cost. The energy is lost as infra-red heat rays within the walls of his home instead of producing visible light.

Utilities prefer satisfied customers to a few extra kw.-hr. because they know that satisfied customers ultimately use more kw.-hr. than dissatisfied customers. In many instances, therefore, the savings of an efficient wiring system would pay for itself.

But what are we to do about this problem? First, about this problem of adequate wiring for future homes; second, about rewiring?

Not Lower-Cost Wiring

Is its solution to be found in the invention and development of a radically new line of low cost materials? So far the use of service entrance cable, electric metallic tubing, low-priced switches and receptacles and other new materials which have made material reductions in home-wiring costs has not greatly increased the number of outlets installed. Lower-cost wiring, therefore, is not the complete answer.

In a recent survey the Niagara Hudson Power Co. in New York state asked 19,000 persons visiting model homes what their pet peeve was regarding their own home. The first on the list was "not enough closets;" the second, *"not enough outlets."* This was listed by 11,000 out of the 19,000. The *Detroit* News in a similar survey got almost the same answer in Michigan.

The public, therefore, is ready for some help. It is conscious of the problem but not of the solution.

But just ocrrecting the complaint of "not enough outlets" does not give the answer. It goes far beyond that. True, we must give the public enough outlets for every anticipated appliance and load; but to these outlets we must furnish satisfactory pressure to operate them by means of adequate copper.

The electrical load in the home has grown from 3 kw. in 1910, when we had only a lighting load, to 30 kw. today, an increase of 10 to 1. Have we in the industry raised our sights in regard to wiring in the ratio of 10 to 1? Does an adequate wiring installation today cost ten times as much as an installation in 1910? Does the public realize this increase? We all know the answer is "no."

The problem has both technical and sales aspects.

The Technical Problem

To get down to the fundamentals of the technical problem, let us define an adequate wiring installation with an eye to the future—when the ratio of connected demand will possibly exceed the present 10 to 1. First, for an adequately wired home we must have ample service conductors. The 1937 NECode in Section 2202 gives *minimum* specifications for the computation of adequate service. The Handbook of Interior Wiring Design goes further and gives specifications as follows: Four rooms—3 No. 6 with 60-amp. switch; 5 rooms—3 No. 4 with 60-amp. switch; 6 to 9 rooms—3 No. 4 with 100-amp. switch; 10 to 13 rooms—3 No. 2 with 100-amp. switch.

We may safely say, then, that the service should be not less than three No. 4, except for very small homes, and complete with 60-amp. minimum service switches or ample circuit breaker control units, 50-amp., double-pole or larger.

Second, we must provide separate circuits of adequate copper which will furnish current for the fixed appliances—the electric range, hot water heater,

built-in bathroom heater, refrigerator, ironer, etc.

The third feature of an adequate system is decentralized distribution. We have been prone in all our conventional wiring methods to bring the service to the basement or a rear hall and there concentrate fuses or circuit breakers from which were extended long runs of small final circuit wires. These final circuit wires were usually No. 14. In the estimation of many experts this has been the stumbling block of the home wiring problem.

Like Office Building Like Home

We do not use such methods in large structures or industrial installations. Let us apply the same principles of distribution to bring proper voltage to the outlet in the home—decentralize the distribution center with heavy sub-feeders to the various load centers. This can be accomplished by means of small fused panels, multi-breaker combinations or groups of individual circuit breakers located at several strategic points throughout the house. These should be fed by means of heavier sub-feeders—at least one size larger than the branch-circuit conductors, using three-wire distribution to reduce the amount of copper needed and to give better distribution voltage.

Regardless of the materials used the principle is right. It provides for the future, gives greater flexibility and the diversity in these sub-feeders will give from 20 to 40 per cent increased capacity over the same number of individual circuits that run back to a centralized point.

Fourth, the connection from the branch load center to the last outlet on the circuit should be as short as possible. This can be accomplished by splitting the branch circuits into a number of short branch sub-circuits, all emanating from one breaker or fuse. This paralleling of the final circuit wires gives an increase in capacity with very little increase in cost. It will increase the efficiency of the system. With No. 12 or even No. 14 wire it is possible to achieve the equivalent capacity of No. 8 or No. 6 wire without increasing the number of circuits and with only a slight increase in the total footage of small wire or cable used. What we need in home wiring today, to use a bridge term, is "strength and not length."

Fifth, the question of "adequate outlets" is perhaps the most emphasized part of the problem. To secure an adequate number of outlets we must first provide an outlet of proper size and type for every anticipated fixed appliance, such as range, clock, etc.

We should also provide an outlet for every anticipated lighting unit: lights in closets; general lighting for all rooms as well as specific lighting for individual tasks; at least two lighting sources for every stairway, one top and one bottom. At all costs, provision must be made for every detail of Better Light for Better sight with plenty of safety factor.

The 1937 code in Paragraph 2110 requires that in every living room, kitchen, sunroom, recreation room and bedroom sufficient convenience outlets be provided apart from the lighting outlets so that no point on an unbroken wall space is over 10 ft. from an outlet; that at least one outlet of 500-watt capacity be provided adjacent to every built-in laundry tub or tray. An easy rule to use in specifying the location of these outlets is to remember that the average appliance or lamp uses a 5-ft. cord. Can you reach an outlet with such a cord?

Sixth in the definition of an adequate wiring system is "convenient control." By convenient control is meant the flexible control of the lighting units by means of 3- and 4-way switches by each important entrance so that one can light his way through the house and turn it off behind him. The switching of split convenience outlet circuits in bedrooms, etc., so that we may control the lamps from the doorway instead of having to cross a dark room. The use of this split outlet leaves a live outlet for the permanent appliances or the portable units.

Why Haven't We?

But this is the answer only to the technical side of the problem. The important question is this: We have known what constitutes adequate wiring and what the lack of adequate wiring has done—why haven't we been able to put the story across to the public?

The answer is that we haven't sold the public.

No one has found any magical publication, folder, advertisement or demonstration that will make people come in and demand adequate wiring. *Nothing will supplant personalized selling*, although advertising and all these other sales helps will make the job easier.

Because wiring is largely hidden in the walls where it cannot be seen, because often at the time of sale or conception a wiring system consists only of a few odd symbols on a blue-print, because apparently there is nothing in the outward appearance of wires which shows their difference in current-carrying capacity, it is hard for the public to visualize and, therefore, to appreciate its many ramifications, weaknesses, faults or qualities.

This failure of the public to *visualize* the many details of adequate wiring is the stumbling block of the electrical industry.

Our need today is to tell a story to the public that will demonstrate what adequate wiring is and *what it will do for them.*

We are on the way at last.

The electrical industry—through an industry committee composed of members from the EEI, NEMA, NEWA and NECA—has plans formulated for such a program: a sales drive called the industry's "Adequate Wiring Program."

This plan will be one answer to the problem of how we can visualize adequate wiring to the public.

Contractors, dealers, utilities should attempt to tell, to dramatize a visual story of adequate wiring and its resulting advantages.

More Electrical Homes

When electrical leagues were first sponsoring "electrical homes" better wiring took a decided step forward. More electrical homes—and not just model homes—with special emphasis on the wiring and not so much on the drapes will be another means of visualization.

Many in the industry have been afraid that they could not sell adequate wiring because of price. But the difference between a bare necessity job and a fully adequate job is only from 1 to 2 per cent of the total cost of the house. This difference, for an average home when amortized monthly over a 20-yr. period, means only 50c to $2 per month. Showing this difference in cost is another answer in the visualization of proper wiring.

You will hear much of the many programs to promote electrified homes—"Better Light-Better Sight," "The Electrical Standard of Living," etc. The public will be urged to start to plan now for an electrified home. All of these programs will help the public to visualize the needs of an adequate wiring system. Let us remember the first step to better living is a well-planned wiring system. It is the foundation stone on which all these other programs must build.

And so while we call the wiring problem the stumbling block of the industry, let us examine it more closely in the light of publicity. Let us view it from all angles, and if we can so illuminate it that Mr. and Mrs. Home Builder, as well as all branches of our industry, can also see it in its true perspective, I am sure that we shall come to realize that it is no longer a stumbling block but merely an outcropping—an outcropping indicative of huge hidden resources for all of us, and leisure, joy, comfort and convenience for the public.

Fluorescent Lighting

A Natural for Electrical Contractors

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A conference room tabe lighted by four daylight fluorescent lamps operating in a special luminaire

NOW commercially available to the electrical industry is a new device of many potentialities. In time it will do much to revolutionize the lighting field. It will make extra proft for manufacturers, utilities, dealers and, particularly, contractors. It will be used wherever artificial light is needed—in stores, factories, offices, homes, schools, theaters, etc. Truly, here is a device of terrific importance. Its name is the "fluorescent lumiline lamp."

The fluorescent lumiline lamp is a light producing device operating on a principle completely different from any previous light sources. Ultra-violet radiation (popularly referred to as black light) generated by a mercury vapor discharge in a glass tube is converted into white or colored light, at a high efficiency, by powders coating the inside surface of the tube.

This lamp is capable of doing certain things a Mazda lamp cannot do; in its present stage of development, however, there are many applications where the Mazda lamp is a more logical choice. The situation is concisely summarized by Ward Harrison, director of General Electric's Nela Park engineering department. "Fluorescent lamps complement rather than aggressively compete with the incandescent lamp in every important particular."

Advantages and Disadvantages

This is the case because, in spite of the many advantages of fluorescent lamps, they have at present disadvantages which in a large number of instances are sufficient to shift the balance in favor of Mazda lamps. Fluorescent lamps must be operated on a. c. circuits. Each lamp must have its own auxiliary and the combination, as yet available, operates at 60 per cent power factor. They cannot be dimmed satisfactorily and their life will be unfavorably affected by constant flashing. They are available in tube form only and are uniformly rated at only 10 watts per foot of tube. It is hardly likely that they will ever be suitable for concentration or projection purposes.

However, for many important and frequently encountered applications the disadvantages are relatively unimportant and for other applications the disadvantages are more than outweighed by the advantages. The nature of these advantages is indicated as follows:

I. Fluorescent lamps are more efficient for certain types of lighting:
   1*. They produce light two to four times as efficiently as medium and low wattage Mazda lamps.
   2*. They produce a daylight type of light five to ten times as efficiently as Mazda lamps with necessary screens or filters.
   3*. They produce blue, green and blue-green light 20 to 150 times as efficiently as Mazda lamps with filters or screens.
   4*. They will reduce the heating from lighting of an area or room in proportion to the increased efficiencies given above.

II. Fluorescent lamps have a better range of light colors:
   1. The daylight fluorescent lamp is very close to the color the U. S. Bureau of Standards recognizes as daylight color.
   2. The blue, green and pink colors are far more attractive than can be produced with Mazda lamps; only in deeper red colors do the latter have an advantage.
   3. By the use of gelatins, screens, etc., the fluorescent lamps can be made to yield fine shadings of colors not possible with Mazda lamps.

III. Fluorescent lamps are better adapted to most forms of modern architectural lighting:
   1. They give a linear distribution of light at maximum efficiency.
   2. Their low wattage per foot permits long strip or panel or cove jobs without excessive total wattages.
   3. They make possible continuous lines of light at about four times the efficiency of incandescent lumiline lamps.

IV. Fluorescent lamps are a new development:
   1. They will probably be subject to more material improvements in efficiency, in life and reductions in price than is possible with a Mazda lamp which has been given intensive laboratory research and manufacturing attention for more than 25 years.
   2. They have an appeal of newness which has commercial advantages in stores, hotels, restaurants, etc.

As a result of these advantages, fluorescent lighting will make practicable certain types of lighting which have been impracticable or open to serious objections in the past. For example consider those applications of lighting where heat must be avoided.

The lighting of meat, candy and food stuff display cases has been badly handicapped in the past because the heat accompanying the incandescent lighting has had a harmful effect on the perishables displayed. The daylight fluorescent lumiline lamps will deliver the same illumination as ordinary Mazda show-case lamps with one-third the heat. In addition, they will show the merchandise to much better advantage because the light is such a good approximation of noon sunlight.

Top: Floodlight designed for Golden Gate Exposition colored effect lighting. Bottom: The fluorescent lamp is available in four sizes, each in seven colors. Smallest is 18 in.

Adequate lighting in regions of high summer heat has been retarded because of the accompanying heat which further increases personal discomfort or is an extra burden on the air conditioning plant. Fluorescent lighting will go a long way toward overcoming temperature limitations of Mazda illumination. Furthermore, there is a definite psychological advantage to the use of the daylight fluorescent lamp in places where the air temperature is high. Its blue-white color gives an impression of coolness and will thus be all the more acceptable.

Because of their high efficiency in the production of white, daylight and colored light, as well as their linear spread of light, fluorescent lamps will bring into popular buying range and therefore open to widespread sale.

*These figures include losses in vibrator type of auxiliaries.

classes of lighting which have always been considered desirable but have been beyond the reach of many in the past.

Daylighting of entire stores or merchandising areas has long been considered desirable, but it has been impracticable in the past. To secure a satisfactory approximation of daylight color with Mazda lamps requires the use of carefully made filters and an unavoidable light loss of 70 per cent in the filtration process. In the use of 500-watt Mazda lamps which operate at 20 lumens per watt, the light production efficiency drops to 6 lumens per watt after conversion to daylight color by filtration. The average-size fluorescent lumiline lamp produces just as satisfactory a daylight at about 30 lumens per watt including auxiliary losses. Obviously, five times as much artificial daylight can be produced with fluorescent lumiline lighting as with Mazda lamps and filters. Instead of limiting daylighting to small pools underneath so-called color matching units,

First barbershop to be lighted by the G. E. fluorescent lamps is this parlor at Nela Park, Cleveland. The installation delivers nearly 100 ft.-candles on all sides of customer's head

entire departments can be lighted with economy.

Artificial light of color-matching quality has long been in demand by various industries such as printing, fruit packing, sugar refining, ink manufacturing, etc. The writer has found that the combination of a 30-watt daylight fluorescent lamp and a 40-watt Mazda lamp will produce a color of light suitable for most severe color-matching requirements. Because of the low cost of such combination lighting, conveyor belts, inspection tables and entire departments can be lighted with artificial light of color-matching quality and so be entirely independent of daylight for the conduct of their business.

Painting with colored light, or mood lighting, has long appealed to the popular imagination but its past utilization has been severely limited by the inherent low efficiency of colored-light production with incandescent lamps. Not only is this a serious item in operating expense but it is also a great handicap from a heating standpoint. How far the fluorescent lamps will go in overcoming this handicap is indicated by the following table, which compares the relative efficiencies of fluorescent lamps and two arrangements of Mazda lamps commonly used in the past for colored lighting. Note that the efficiency figures given for the fluorescent lamps include the losses in vibrator types of auxiliaries.

Color of light produced	Efficiency using 25-watt or 40-watt coated Mazda lamps. Lumens-per-watt	Efficiency using 100-watt natural-color bulb Mazda lamps or 100-watt clear Mazda lamps and color hoods or roundels. Lumens-per-watt	Efficiency using fluorescent lamps — including vibrator auxiliary loss. Lumens-per-watt
Blue	0.1	0.6	18
Green	0.4	1.5	58
Yellow	5.0	9.0	18
Red	0.6	2.5	2.7
Pink	0.8	3.0	20.0

As compared with the blue or green-coated incandescent lamps, the fluorescent type will produce about 150 times as much light per watt.

More Uses for Fluorescent Lamps

Luminous store fronts, streamlined lighting units and built-in lighting with luminous panels of opal and configured glass would have been more generally used in the past if the operating expense had not been materially higher than ordinary commercial lighting. The higher operating expense, to a substantial extent, has been the result of the required use of many small lamps instead of the use of larger, more efficient Mazda lamps as in conventional commercial lighting. Fluorescent lamps make it possible to distribute brightness evenly over large surfaces and still receive the benefit of high light-producing efficiencies. It is true that the initial investment required for fluorescent lighting is higher than with incandescent lamps, but for applications such as these the operating expense is lower and the total cost of light less.

Cove lighting, which has always had a great popular appeal, has actually been employed to a very limited extent because it, too, has required the use of many small lamps. The relative inefficiency of these lamps, resulting in high operating costs and objectionable room heating—particularly where tinted light was desired—has put this type of lighting out of the reach of most people. Here again fluorescent lamps are applicable because their linear form makes it easy to avoid spottiness and their high efficiency insures half the heating per lumen of even the largest of Mazda lamps.

The relighting of many office buildings which give tenants less than 10 ft.-candles of artificial illumination has been desired by owners and managers but the major item of new feeders, subfeeders and distribution circuits required for better illumination with past lighting methods has been responsible, in large measure, for an indefinite postponement of the improvements. Fluorescent lighting has splendid possibilities of overcoming this handicap because of its high efficiency and because the 30-watt tubes operate on 220-240-volt circuits. The two factors combine to reduce greatly the required circuit current per lumen produced, although the contractor will have to provide power factor corrective equipment.

Benefits to Contractor and Dealers

Electrical contractors and dealers should benefit greatly by the profit possibilities of fluorescent lighting, not only because of its manifest advantages to consumers but also because, for some considerable time, its sale will be limited to channels which can take care of the necessary installation work and are able to work out the various design problems involved. Replacements for some time, too, will logically fall to the lot of electrical contractors who have associated themselves with this activity.

It is highly desirable, then, that progressive electrical contractors prepare to get in on the ground floor of this profitable business. First they will find it advisable to purchase and experiment with a few of the various types of lamps. Second, surveys of customers' premises having diversified lighting requirements will reveal many, many opportunities to apply the fluorescent lamp to advantage.

Fluorescent lamps in an inverted trough can be used for indirect lighting as shown by the installation below

Electricity — The

FRANK A. HANSEN, director of the Western Institute of Light & Vision, changed his headquarters recently to 3407 Lowry Rd., Los Angeles. This is significant because his studio is in a new home he has built embodying electricity as the hub of its existence. Pictures on these pages show some details of how ingeniously, thoughtfully and effectively electricity is employed.

Nicholas Electric Co., Hollywood, wired the house with a real sense of its functional plan. Wiring ran to 10 per cent of construction cost; appliances, 14 per cent of total investment. Connected load is 35 kw. (160 amp. at 220 volts). Largest consumption was in March —781 kw.-hr., of which 463 were for water heating—when scores of people inspected the house and tested its features. Following pictures clockwise from top left corner:

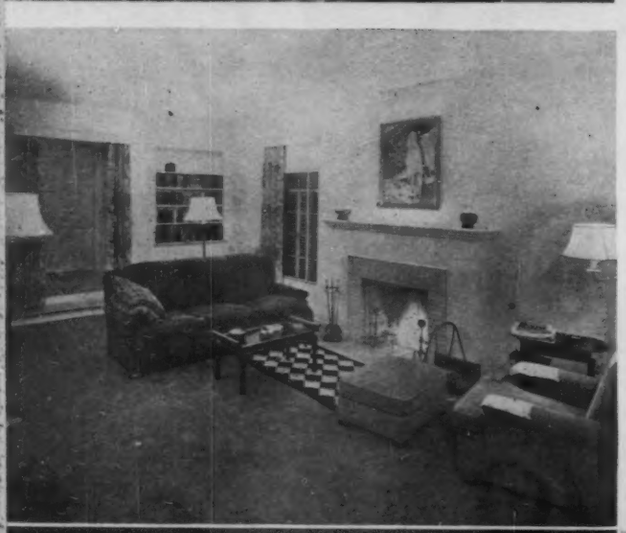
• Range is tiled in, so that hot dishes may be set on either side; above it is mirror-doored spice cabinet; in ceiling a vent fan and built-in lighting panel with control lens.

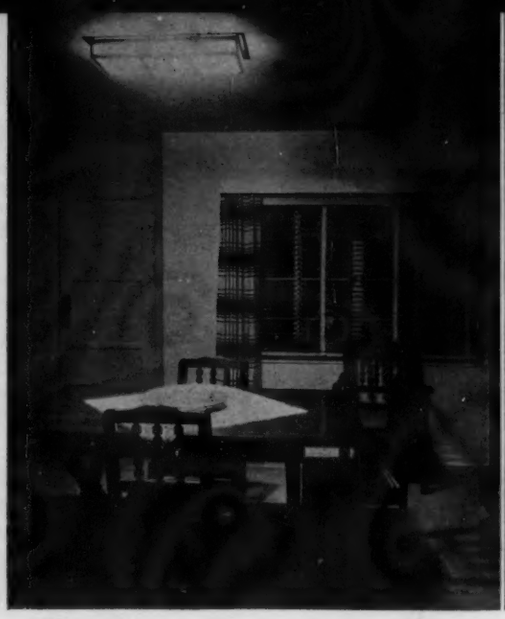
• Night — lighted house number; lock control 3-way switch for garage and entry stairs. Oriental, 6-watt, lily garden light illumines lower steps. Next picture shows luminous brass handrail using three 30-watt, 18-in. lumiline lamps. Recessed lenses over front door light porch. Brightness increases from street to door.

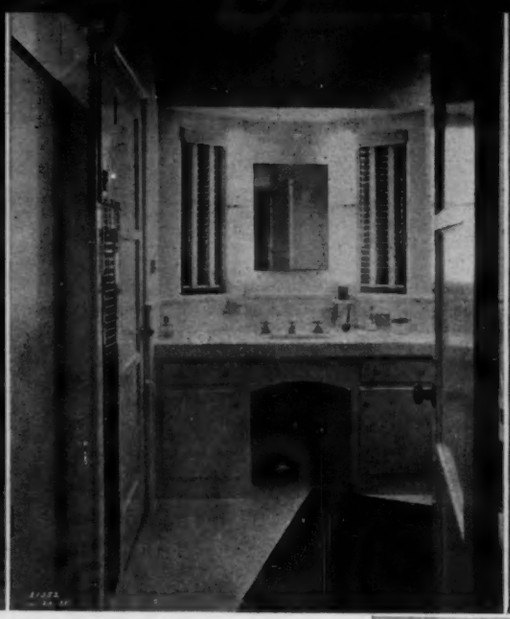
• Dining room has two levels of illumination from a 3-lens unit in ceiling. White glass side panels transmit light to ceiling. Intense light punched down on table linen, silver and food. • Besides flushed opal glass lighting units over bath tub and in shower stall (waterproofed), master bathroom provides 78 ft.-candles of light for shaving from two new Wakefield units with white glass semi-cylinders, each section having a 60-watt lumiline lamp. Auxiliary heat comes from a 2.5-kw. head-to-heels electric heater.

• Light strikes a curved reflecting surface from behind this flesh-colored mirror in the bedroom, is diffused and flatters the face. A similar mirror in the dressing room lights the face by means of two white glass panels and aids make-up. • Built-in reading light above each bed is separately switched; by deep recessing, light is controlled so as not to disturb other person asleep. Convenience outlets on switch plate are high; accessible for heating pads, etc. Speaker unit of Vocalphone allows person resting or ill to communicate with kitchen or answer front door callers. A 6-volt night light indirectly lights a plaster plaque on the opposite wall.

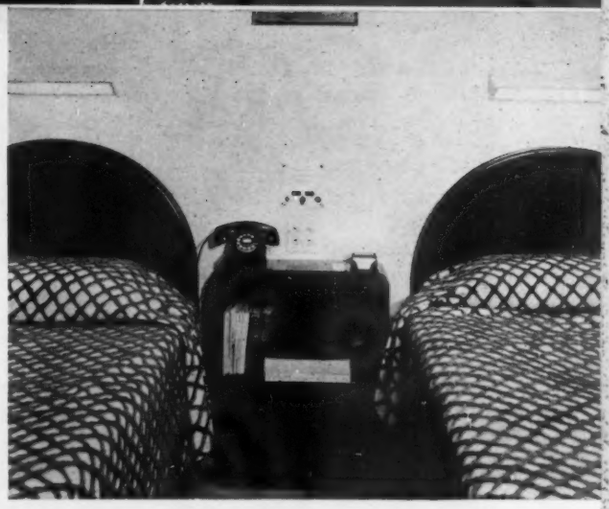
• Studio-office of Frank Hansen makes practical use of a kitchen work surface idea. Book shelves, with lumiline lamp and reflector assemblies under the front edge, light reference material spread on work counter top to 35 ft.-candles. Drawers and cupboards below provide storage for stationery, etc. General lighting comes from indirect trough above windows, coming from same direction as daylight. Room illumination is 25 ft.-







Hub of the House



candles, plus local lighting at desk if wanted. Acoustical plaster reduces noise from street or typewriter. This is the new headquarters for the Institute.

• On the service porch is the 22-circuit Multibreaker panel controlling and protecting all electricity in the house and garden. Location of ironing board outlet brings exclamation from women, "Just where I would like it." • Night view of garden lighting—switched in 5 arrangements to obtain effects, it adds to enjoyment of garden. Kim garden lighting equipment blends in with garden itself. Lumiline shaft units direct light toward the wall and garden, forming a background for the picture. Another effect, that of full moonlight, comes from a birdhouse projector, mounted high at the right.

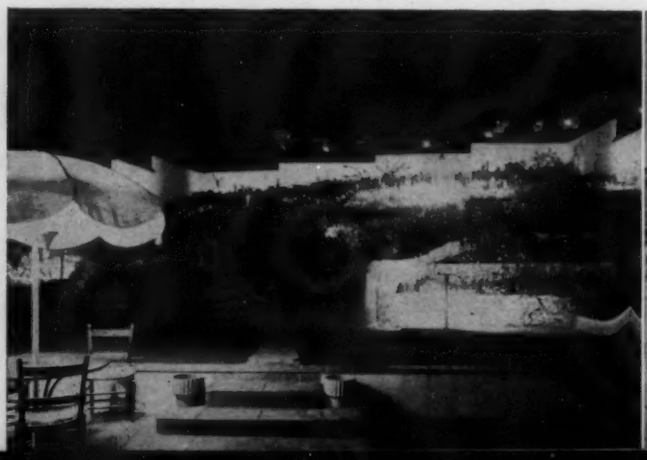
• Patio at night—an outdoor living and dining room with ample electric facilities for variety. "Morning Glory" light under umbrella. Light sources concealed under roof supports are for general lighting. Insectocutor can be used to attract and kill insects. Four weather-proof outlets in patio and two in the lawn area furnish extra sources of light with portable equipment for games. Direct access to the kitchen facilitates serving.

• Plugmold surrounds the living room so that furniture may be moved at will and outlets always made available. Some circuits are switched from door entrances.

• Controlled by a 3-way switch at each entrance is a glass-covered reflector, flushed in the top of the mantle, with 100 watts of lumiline, to light picture and the room only to twilight intensity if wanted. Above shows the room with all floor IES lamps on. With 3-light bulbs a wide variety of intensities is possible.

• Finishing with the kitchen (on opposite page)—lighting is flexible and conveniently switched wherever wanted. Three Holophane lenses over the sink, one of which can be switched on at doors; 30-watt, 18-in. lumiline lamps under cupboards, and ceiling panels over range and breakfast table furnish light. Sink contains dishwasher, garbage disposal; has Cord-away retractable cord unit for appliances, and many outlets. Unusual are: a niche behind which the mixer can be kept out of sight, cupboards for appliances, a kitchen desk that folds away, Vocalphone connecting to bedroom and front door, a special vent above the refrigerator to draw away heated air, increase efficiency. An auxiliary fan type Thermador heater is built in to the breakfast room wall. Lighting intensities at the drainboard work area are 35 ft.-candles; at the range top, 20; at the breakfast table, 12.

• Other details and the color schemes are equally well planned for utility, cleanliness and pleasing effect. A workshop in the basement equipped with trolley-duct is not illustrated. Other electrical details omitted are too numerous to list here. Installation required 2,220 ft. of conduit, 7,550 ft. of wire. House and garden total 136 outlets in 22 circuits. Architect was Charles E. DuBois.



Building Managers and Contractor Service

One maxim the contractor should always remember in his effort to keep building managements sold on his service is this: It's what your customer wants that counts . . . Herewith some suggestions on how to fill the bill

By HENRY W. YOUNG

WHAT has the electrical contractor to sell in the way of service to an office building owner, manager or management company? The contractor knows, but too often he assumes that the building management knows—which is not always the case. Building operators have a commodity and service of their own to sell; so many square feet of floor space to be rented and maintained. Electrical maintenance is but one element in their problem.

Dale Carnegie is always hammering away at one point in selling: it isn't what *you* as a salesman want or would like to see come about that counts. The customer doesn't give a cuss about that. It's what *he* wants. What the building manager wants is to maintain the maximum percentage of occupancy and make a profit for the owner at the same time. If he can't do that, he will probably be fired. Therefore, any contractor who can put himself in the manager's shoes and honestly try to help him hold his job is on the way to being a very good salesman.

"That's book stuff and likewise old stuff," says the contractor. "Everybody knows that." True enough. But it is a good thing to trot out the old first principle and ponder over it. It keeps us from falling back unconsciously into the what-I-want attitude.

Again, "What have the contractors to offer that will help the building manager show a profit and hold his job?"

Portland Survey

The question was put, not to the contractors, but to a large number of building agents and managers in Portland. Portland was chosen because it is reported that over 50 per cent of the office and commercial buildings there are electrically maintained by contractors, who, apparently, have done a better than average selling job.

What the managers had to say boils down to a list of eight primary vantage points. These are shown in the accompanying box in the approximate order of their importance.

There is still, however, another problem that is puzzling the building manager. That is the problem of maintaining the rising standards of illumination. J. C. Plankinton, manager of the sales bureau of Northwestern Electric Co., hits the nail on the head this way:

"Building owners realize that the modern trend in illumination is toward a higher tempo. Tenants are demanding more and more light. The building owner or manager would like to give it to them freely. But to do so involves expense not covered by a corresponding increase in rent. Tenants should realize that since this better lighting is for their benefit they should bear at least part of the cost of the improvement. In such cases, the maintenance contractor can become a valuable intermediary. Such educational work as he may do with tenants as to the value of better lighting can be tempered with explanations of the costs to which the building would be subjected and with suggestions as to an equable division of the expense."

Step Carefully, but Be a Help

This point requires careful handling on the part of the contractor and a complete understanding between him and the management. However much he might like to be a lighting evangelist preaching the glories of better light to every tenant he contacts, the contractor cannot open his mouth without coming into conflict with the manager, his employer, who is already striving to maintain the best average conditions he can within the limits of his budget. But where there are glaring examples of inadequate illumination among individual tenants there is a way of discussing the matter with them and the management at the same time on the basis of cooperation. Many times such improvements as may be suggested by the contractor may be the means of helping the management to hold a tenant who is about to look elsewhere for the lighting conditions he needs.

Plankinton also points out another valuable function of the contractor relating to the proper voltage of lamps.

"It pays to get the proper voltage lamps, since you are not buying glass but light. We recommend the 120-volt lamp on our lines as the most economical from all standpoints. Yet we sometimes find buildings lighted with 125-volt or even 130-volt lamps. Taking 120 volts at the socket, if 125-volt lamps are used only 87 per cent of the light is obtained; 130-volt, only 76 per cent. The over-all cost per unit of light is even somewhat more with the higher voltage lamps. What is more important, however: with all sockets full of improper voltage lamps, the illumination may still be found on the border line between fair and unbearable conditions. In such cases, a mere change to the proper voltage lamps may solve the problem without changing the system. With this matter of lamp voltages and consequent light the electrical contractor is thoroughly conversant, and the problem of getting the most out of the system may safely be left to him."

Another factor of importance to the contractor in selling his services to building managements is his relationship with the city electrical inspection department. The up-to-date electrical inspectors are coming more and more to look upon their function as constructive rather than merely prohibitive. By working in harmony with the inspection department and by promptness in taking out permits and filing notices of completion and in other ways facilitating the work of the inspectors, the contractor indirectly gains valuable assistance in selling his customers and keeping them sold. To get into a position where the electrical inspection department is enthusiastic over the work of the contractor means a lot.

Praise for the Contractor

Portland is fortunate in having for its chief electrical inspector L. W. Going, who has persistently promoted the idea of wiring adequacy in the formulation of the Portland code. He is more than an inspector, since he is also a potent force in bringing about a wider use of electricity. He is a salesman for the industry in an indirect way. It is gratifying, then, to find that Going is appreciative of the contractor's service in connection with building maintenance. He made the statement that "unless a build-

ing can afford to keep a full-time, qualified, licensed electrician in its employ, it is better to let the work out to a good electrical contractor. We always hate to inspect a building where the work has been done by a Jack-of-all-trades or by the supposedly all-around engineer that the building may employ. Such men do not and probably cannot keep up with electrical wiring from the standpoint of materials and methods."

The contractor rendering an electrical maintenance service is bound to have on his list many, if not a majority, of the older type buildings where the original wiring system does not measure up to modern demands. If the owner of the building has sufficient faith in his maintenance contractor, when alterations or extensions are to be made the work may come to him automatically. However, as in any other class of sales work, it is dangerous to take for granted that you are so strong with your customer that you will always get the business.

Working with the Customer

One of the best ways to keep a customer sold is to keep him informed. Be the one to solve his problems. Explain his electrical system to him so that he understands it. Forewarn him of what may involve expense. Show in advance how the job could be engineered in order to give him an adequate system and at the same time the most for his money.

The questions he may have in his mind are probably so simple that you did not think it worthwhile to touch upon them. But why not anticipate these questions and be the first to post him on such matters? Why not make up a report for him? Analyze his building from the electrical standpoint and give him something to mull over at his leisure. Walk up to him with "the wiring in this building is all out of date and inadequate and it's got to be changed," and his answer will more than likely be: "The hell you say." But give him a well-written report of conditions, in words that he can understand, and point out the value of such changes to his property, and your back will hardly be turned before he is going into it. Then, when the time comes when alterations must be made, he is not going to think of you as just the electrician who fixes things when they go wrong but as a contractor qualified and with sufficient organization to handle a "big re-wiring job." Whatever it may be, it is going to look like a big engineering feat to him.

Some of the simple questions that are buzzing around in your client's mind may be as follows:

"The tenants are hollering all the time for more light. What do they call good light anyway? I put in those semi-direct-lighting, enclosed unit fixtures less than five years ago—best on the market."

Explain in your report how modern lighting requirements in offices now call for a 20 ft.-candle minimum; how those units will not deliver more than 10 or 12, and spotty at that.

"Honest, aren't all types of lighting fixtures about the same, if you put enough lamp power in them?

Explain the difference between direct and indirect lighting from the standpoint of his conditions; show him how uniformity of illumination and lack of glare is essential; tell him how he can obtain it.

"How much electricity does it take to light a room?"

This calls for an explanation that it is dependent on the wiring system; that if it is not adequate he cannot get enough current into the room in the first place. Explain how a system that will pass from 3 to 5 watts per square foot of floor space would be able, with proper fixtures, to produce evenly distributed, well-diffused light of from 20 to 60 ft.-candles.

"Why can't I simply put higher wattage through my present wires and get the same results?"

Tell about the carrying capacity of wires; how they heat on overload; how insulation deteriorates from heat, with corresponding danger; why an overloaded circuit cannot deliver full voltage and his lamps burn low and he does not get the full amount of light for his money; how heat given off from the overloaded wires is utter waste.

"What must I have in the way of re-wiring to put this building in first-class electrical shape?"

Point out the three things involved—main feeders, fuse panels and branch wiring circuits.

"Have I got to have all these things changed in my building? It will cost a small fortune."

Ifs and Their Answers

Your analysis of his building will possibly show that he does not need all these things. If it is a metal conduit installation, perhaps pulling new wires will suffice. If not, there are metal moldings to be considered, of good appearance if properly installed. If new feeders are necessary, show the simplest and most economical way of running them. If a new panel board is going to be needed, explain how, through grounded neutral, only half as many fuses are now required, and the new board will have twice the number of circuits and still go in the same size cabinet as before.

It is not intended, in any of the foregoing, to make the electrical contractor out as lacking in the essentials of salesmanship. In spite of the many unthinking criticisms that he is no salesman, a poor business man and all that, he at least averages up in sales ability with any class having a dual function to perform—that of producing and that of selling his product or service.

It is simply intended to convey the idea that the customers with whom he is dealing in this case must of necessity look upon the electrical installation and what they are supposed to get out of it from a viewpoint that is far more elementary than his. In the rush of handling the other end of the business—the construction end—one easily "forgets to remember" that the customer is constantly in need of education along electrical lines. The giving of this is a powerful aid to the contractor in keeping himself and his services sold to the customer.

Advantages of Electrical Contractor Service

(1) Compliance with the city's electrical code is automatically assured. The building manager dreads above all putting in an electrical installation that the inspector might throw out. To do it over costs money. The work must be done right the first time.

(2) No dealing with the union and no question of labor jurisdiction. The contractor assumes these burdens.

(3) Better workmanship. The contractor employs high-grade, licensed electricians and has a reputation to uphold.

(4) Contractor is qualified to go ahead on all classes of work, from the simplest alterations and repairs to the most extensive changes in the wiring of the building. Manager does not have to spend time and worry over trying to pick this, that or the other man to do a certain kind of work.

(5) Plan is flexible because the contractor may be given all the purely maintenance work, plus any extensive alterations or new work; or, if desired, the latter may be put out on bids to a number of contractors.

(6) Contractor is a specialist in his line. Minimum time and trouble required to deal with him.

(7) Usually desirable to give all the maintenance work on one building to a single contractor. He gets familiar with the whole electrical system of the building and can locate circuits or make alterations without delay.

(8) Payment to the contractor can be made on the time and material basis and there is no guesswork. Contractor renders invoice covering his cost for both labor and material, and then adds an agreed upon percentage for his overhead and profit —usually 15% to 20%. Or the contractor may invoice at his sales price on material and labor, at the prevailing mark-up on the hourly scale of the latter.

Just What Is Explosion-Proof?

By HERBERT J. UFER
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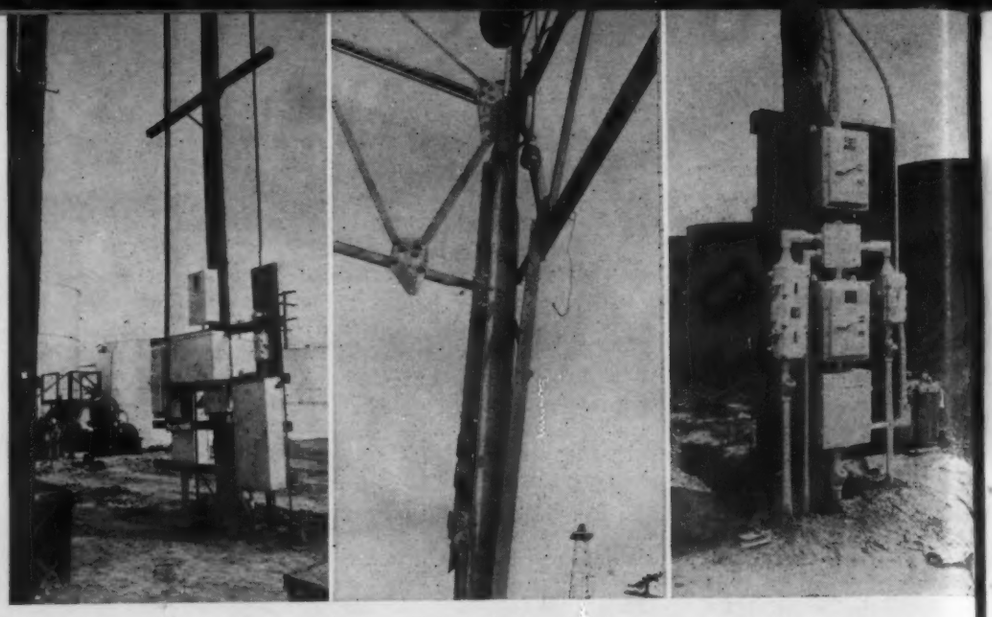


Above: Top—Two sure sources of information on explosion-proof installation—Article 500, NE-Code, and Section II, Underwriters' "List of Inspected Electrical Equipment." Center—Contrast the heavy explosion-proof switches at left with the gasketed vapor-tight switches at right. Above is a new explosion-proof work-light. Bottom—Conduit fittings common to explosion-proof jobs around gasoline stations. The light-weight, gasketed pull-box fitting beside book is merely vapor-tight, in comparison with the heavily built box beside it

EDITOR'S NOTE: *Electrical contractors and even city electrical inspectors find it difficult to tell the difference between explosion-proof equipment and vapor-tight, gasketed equipment designed for outdoor exposures. Because of their expense, users avoid the installation of true explosion-proof materials except where absolutely necessary. The way to avoid confusion in selecting such equipment is not simple. First, it requires a thorough reading of Article 500, 1937 edition of the National Electrical Code, to determine just what type and class of equipment must be used for particular kinds of hazardous surroundings. Then the selection of the equipment must be made by reference to the "List of Inspected Electrical Equipment," published regularly by Underwriters' Laboratories Inc., in which the particular device is listed by manufacturers' name, catalog number and name-plate ratings. In this article Mr. Ufer tells how explosion-proof equipment is tested for various kinds of hazards, how to distinguish between the types of hazards and how to find the necessary equipment. The illustrations show that even inspectors err in detecting the difference between types of equipment merely from field inspection without reference to the Underwriters' list; and some samples of true explosion-proof equipment in common use.*

EVIDENTLY some confusion exists in the minds of electrical contractors, electrical inspectors, maintenance engineers and users purchasing materials as to the difference between devices for use in hazardous locations and those designated as vapor-tight and suitable for use in locations exposed only to moisture and non-combustible dust. Field examination reveals a combination of fittings often used together, presumably under the impression that the job is explosion-proof, when the truth is that some of the fittings are not designed for such use.

Practically all users are familiar with vapor-tight equipment; but because it appears rugged, and because they assume that, if it is properly gasketed and assembled, explosive vapors cannot enter the device, they do not understand why it cannot be used in a hazardous area. Many are astonished when told that even in explosion-proof enclosures it is to be expected—in fact, it is known —that explosive vapors will be found. Lack of knowledge or remembrance of a fundamental law of physics—that a perfect vacuum cannot be produced—is probably the cause of most of the confusion respecting the two types of equipment.

Many years ago Underwriters' Laboratories undertook tests of flame arrestors for vents on oil tanks under direction of its chemical engineer, A. H. Nuckolls. About 1916 Nuckolls outlined the first test and research procedure involving explosive gases. Since that time the scope of this work has grown considerably and now includes testing of various types of electrical equipment for use in Class I locations, as defined by the National Electrical Code (article 500).

Special Equipment Necessary

From the beginning of this work, one of the chief difficulties arose from the preparation of definite explosive mixtures for test purposes. Different proportions of vapor or gas with air give different results. Chemical methods for the preparation of such mixtures require considerable time, and the expense involved is too high for practical work. Automobile carburetors available have failed to give the necessary accuracy and control. It was necessary, therefore, to develop special equipment to overcome these difficulties. Nuckolls did this in designing a carburetor which Grice of the Safety in Mines Research Board of Great Britain and Ilsley of the U. S. Bureau of Mines have adapted to their own test procedure and consider the best available.

Wiring equipment designed to comply with Underwriters' Laboratories' requirements for electrical fittings to be used in hazardous atmospheres is forwarded by the manufacturer to the chemical department of the laboratories in Chicago for examination and test. Such equipment is mounted in a test chamber and the explosive gas or vapor-

At right: Left—Motors and push-button control at the pumps are explosion-proof. But starters and circuit breakers at the service pole, which is remote from the gas or oil, can be of the less expensive weather-proof type

Center—In the derrick frame, close to gas sources which may leak, work-light switches and arc-proof attachment socket should be of explosion-proof types and the conduit sealed frequently. The bulb below the light is a drain for the moisture condensing in the conduit system which feeds the lighting units throughout the derrick. Right—One inspector pointed to this installation as an explosion-proof job; yet except for the fittings into which sealing compound is poured, all the equipment is vapor-tight only. Distance from concentration of flammable vapors, however, makes this a safe installation

air mixture is allowed to flow into the device as well as into the test chamber until all the original air has been displaced. The explosive mixture inside the device is then fired by means of a spark plug. Failure of the explosive mixture in the test chamber surrounding the device to ignite or explode when the mixture inside the device is exploded shows that flame in the interior is not carried into the surrounding explosive mixture.

Usually there are created a series of explosions covering the explosive or flammable range of the specific gas or vapor employed. Tests are conducted with the device installed and operated, just as intended under actual service conditions. In the case of motors or enclosures with switches mounted inside, the tests are conducted with the apparatus both in operation and at rest. When these tests have been completed, for example, on an outlet or junction box, the unit is then subjected to a hydrostatic pressure test five times the value of the maximum pressure developed and measured during the series of explosion tests.

Accelerated Dust Tests

Devices are also examined and tested for use in Class II, or dusty locations. Our engineers have made advances in this field and designed equipment for accelerated dust tests. These approximate conditions equal to an installation in use for some time. They furnish the effect of explosion tests with the equipment in operation under a blanket of dust.

Experience and careful laboratory tests have proved that gas-tight conduit systems and enclosures for electrical apparatus are impractical. The necessary joints cannot be maintained in a permanently gas-tight condition. A slow infiltration of the explosive vapors may be expected and whenever the enclosures are open for servicing. As arcs cannot be eliminated in the normal functioning of control and switching apparatus, and as ignition is possible from abnormal causes also, the problem is that of rendering the explosion resulting from such an ignition harmless and confining it to the device in which it occurs by proper use of sealing material or mechanical seals.

It is obvious that visual examination of a device cannot determine these factors. Only by careful examination and test of a device under conditions of actual use can such performance be determined. When devices and materials thus tested perform according to the required standards, they are listed in the Underwriters' "List of Inspected Electrical Equipment." Before this listing is released the manufacturer has agreed that our engineers can visit his factory regularly to re-examine listed devices shipped to the trade and to see that they are identical with the originals tested.

To find the list of those fittings and electrical equipment so tested and found acceptable, reference should be made to Section II of Underwriters' Laboratories, Inc., "List of Inspected Electrical Equipment," (beginning page 330, May 1938 edition). This section includes electrical equipment for use in hazardous locations as defined in the NECode, article 500, 1937 edition. In this section of the list are given the devices tested in respect to safety of operation in the presence of flammable and explosive mixtures of specific vapors and gases with air, and others in the presence of combustible dusts in air.

Use the List

In selecting the kind and type of device for a specific location as defined and recommended by the code, contractors should use this list. In it, as previously stated, the various types of equipment are segregated for convenience and ready reference. It will be noted that the list gives the name of the maker, the rating and class of location for which it has been tested and the marking by means of which devices identical with those which passed the original tests may be identified. Reference should be made to the marking to identify listed equipment which has been tested for use in hazardous locations when this type of equipment is desired.

Whenever a contractor is in doubt he should ask the city electrician, or he may write to either the head office and principal testing station of Underwriters Laboratories, Inc., at 207 E. Ohio St., Chicago; to the San Francisco office at 500 Sansome St. where K. W. Keene is in charge, or to the writer at 839 Fidelity Bldg., Los Angeles.

It is well to note that explosion-proof types of devices listed for use in Class I locations (volatile gases) are not necessarily acceptable for Class II locations (dust), as they may not be dust-tight or operate at a safe temperature when blanketed with dust. Devices that have been found acceptable for both Class I and Class II are listed under each class and group.

It is also well to note that safe use of devices in hazardous locations depends upon their proper installation. Should any new openings other than those originally provided be made in the devices, or other alterations be made to the equipment, their safety may well be destroyed. Holding bolts of the enclosing cases and threaded parts must be screwed tight in the installation.

To Be on the Safe Side

Proper protection against explosion in hazardous locations requires that all electrical equipment exposed to hazardous atmospheres be of a type suitable for installations under such conditions. Proper fusing should be maintained at all times in order to minimize hazards.

Portable lamps or fixtures listed for use in hazardous atmospheres (Class I locations) would not be safe for use in the presence of spray in a spray booth, as the surfaces of these fixtures attain temperatures above the ignition point of cellulose nitrate. Lamps or fixtures listed for use in Class I locations are designed for safe use in atmospheres of the solvent vapors. This should be clearly understood. The solvent vapors have a comparatively high ignition temperature, while the residue of the spray has a comparatively low ignition temperature.

In gasoline pump assemblies the electrical fittings and switches labeled by Underwriters' are required to be constructed in accordance with the requirements applying to these devices for use in Class I locations, under Group D. When these are connected to the supply circuit, the recommendations as outlined in the code for this type of location, as well as the directions furnished by the manufacturer of the pumps, should be followed.

By reliance upon the list of inspected materials and not upon the mere looks of the equipment, the contractor, wireman, inspector, maintenance engineer or any other user can be sure of selecting the right equipment for the right purpose. And in installations in hazardous locations it pays to be sure. The slight saving in cost resulting from the use of the wrong device probably never could compensate for the damage caused by one explosion.

Electrical installations in oil fields or on oil rigs may vary in different localities. Before installations are made or equipment is provided, therefore, it is well to consult local authorities.

Field Wiring Experience—An Inspectors' Symposium

What Happens With New Materials and Theories

NEITHER invention nor necessity have boycotted wiring. In fact, necessity has been so great that wiring methods have been subject to more invention and experiment than usual. Since there have been but two ways open to increased wiring adequacy—(1) sell it harder, or (2) make it cheaper in the hope that the public will buy more—inventiveness has superseded salesmanship as a way out. But inventiveness runs into obstacles. New materials often meet with stubborn resistance.

Much of this resistance springs from habit and prejudice, as A. V. Youens, electrical engineer of the City of Palo Alto, Calif., declares: "One might gather the impression that with the use of several of the inexpensive wiring methods and materials of construction we are surrounding ourselves with a lot of new dangers. I feel that the general run of these troubles are far-fetched and magnified in the minds of many who are biased on account of a reduction in labor or profit on sales. Any reputable manufacturer is vitally interested in the success of his product. He realizes he must keep in mind the cost to the final users while complying with the requirements of the Underwriters' Laboratories. Quite often the result is the saving of labor in installations, and therein lies so much of the struggle to stir up contention against the use of the product. The complaining electrical worker would have you believe his thoughts are in the interest of less fire hazard. As a matter of fact, no one is more interested in holding down the causes of fire than the insurance companies who pay the losses. They are satisfied in carrying the risk if the National Electric Code rules and regulations are complied with."

Questionnaire

On the other hand, more than once it has been hinted in conversation with inspectors, contractors and wiremen that it is in the practical aspects of field use under uncontrollable conditions that some of these otherwise desirable materials fall down. To smoke some of these objections out into the open, ELECTRICAL WEST sent to electrical inspectors in all of the major cities of the West a questionnaire containing these nine questions:

"Inspection departments and contractors have been suspicious of many of these methods, not so much from their electrical characteristics as from the mechanical injury standpoint. What has been your experience under actual field conditions with such things as:

"1. Stray or shortcut paths to ground taken by the neutral, in conditions similar to bare neutral?
"2. Inductive effects on surrounding metals in the structure, such as metal lath, metal gutters, or even the conduit or electric metallic tubing itself where a different path to ground has been taken?
"3. Radio interference experienced in connection with such cases?
"4. Damage to cable assemblies or low cost wiring materials due to construction hazards. This would include non-metallic sheathed cable, various types of service conductor cable, concentric or C.N.X. cable?
"5. Damage to electric metallic tubing from construction hazards?
"6. Experience with threadless fittings both as to electrical conductivity and the mechanical durability of the conduit or electric metallic tubing system using these fittings?
"7. Effect of sag in flexible metallic conduit—both as to wire pulling difficulties, moisture collection or physical damage?
"8. Any experience with armored cable where difficulty in inspection of the hidden work of contractor or wiremen has been taken advantage of to make splices along a run or otherwise to break the continuity of the armor?
"9. Any detrimental experience with service entrance assemblies or new sequence arrangements from a mechanical and installation standpoint."

On the Head

That this matter of mechanical hazard is often more serious than is generally realized by the makers of materials is well expressed by George E. Price, electrical inspector of Orange County, Calif. Price has made a thorough study of field conditions to substantiate his observations, particularly in the field of corrosion. He said:

"I think you hit the nail squarely on the head when you suggest that inspection departments and contractors have been suspicious of many of the less expensive wiring methods, not so much from the standpoint of their electrical characteristics as from the standpoint of mechanical injury."

In answer to ELECTRICAL WEST'S questionnaire were many comments similar to this from Otis Newcomb, city electrician of Long Beach, Calif., who justifies restricting of wiring methods as follows:

"We have experienced no inconvenience or difficulty from the installation of any of the equipment enumerated in your letter. The reason is very easily explained. Flexible armored cable, service entrance cable, flexible metallic conduit, concentric cable and like methods are prohibited by local ordinance. The electrical industry in Long Beach is of the firm belief that this is good practice and to the advantage of everyone concerned, particularly to the consumer."

However, such an answer does not give basic evidence needed in order to determine whether such materials really do stand up under the conditions for which they are designed. Turning then to inspection districts which have had actual experience because of the use of some of these materials, we get the following answers:

Hot Neutrals

"I should say that in general the trouble that might arise from bare neutrals could best be illustrated by referring to the old trouble of 'hot neutrals.' This was a condition caused by grounding of a lateral. Because of various reasons, a potential above ground was created on the neutral. As utility companies have improved their secondary grounds the 'hot neutrals' have continued to diminish. However, we still have a case occasionally and so far as I can recall, usually in outlying districts.

"We have had some electrolytic trouble from the street car system's feeding back to water pipes and from them to customers' neutral to the utilities' neutral and by a similar path in some other location reaching the rail again. I believe that this condition would be aggravated by the use of the bare neutral.

"Bare neutral no doubt is on its way, but I believe we should solve the grounding question first. If the electric industry can agree, first, among its own members and, secondly, with the Water Works Assn., that the forming of a neutral grid—by the tying together of all metallic structures within the premises, the maintenance of a low resistance ground on the network and the elimination of stray current—then I would say that we were ready to try bare neutral. Otherwise I believe we may have some bad effects.

"Leon Evans, communicating engineer for the Tacoma Light Division, says that when bare neutrals come in radios will go out. Interference will be so great as to make radio a nuisance." So answered Bill Gaffney, deputy electrical inspector, lighting division, Department of Public Utilities, Tacoma.

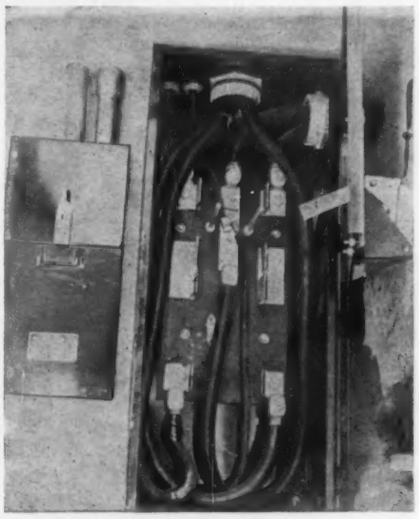
Ralph W. Wiley, chief of the department of electricity, San Francisco, says: "We have had conditions in which the grounded circuit conductor became grounded to the metal enclosure of a panelboard or fixture. This resulted in the current taking a stray path of least resistance back to the source of electrical supply. The conductors of one particular installation were installed in electric metallic tubing placed within the furred metal lath ceiling space of a lodge room. The janitor complained that a terrible humming noise was heard in the ceiling each evening when the hall was being cleaned. Upon investigation it was found that the grounded circuit conductor had become grounded to the fixture canopy, and the fixture current, instead of passing over this conductor, took a stray path back to the source of supply through the metal lath and water pipe. This caused an inductive effect between the ungrounded circuit conductor and the electric metallic tubing, and because the tubing couplings were not tightly installed, a decided humming noise was created. The removal of the ground on the fixture cured the humming condition."

Is It O.K.?

Bare bus riser systems are perhaps the best known examples of a bare neutral system. Several such installations have been made in San Francisco. Theoretically the jobs have seemed desirable and have been approved for installation. However, a case developed recently which opens to question the desirability of this type of installation. A four-wire secondary bus distribution system is used in a large furniture display building. The risers are housed in a shaft enclosure which has two metal ends bolted to the back concrete wall. The heavy copper pipe risers are placed in a row, as shown in the illustration, with the neutrals at one end and the three-phase legs next in line. The metal enclosure on both sides of the riser shaft was bolted to the building frame and presumably was grounded. Recently, an electrician changing a fixture brought his screwdriver in contact between the white neutral wire in the fixture canopy and the edge of the box. An arc of such intensity resulted that the screwdriver was almost burned off. Tests were made at the bus riser shaft and it was discovered that a low potential of very high amperage was being built up in the metal enclosure of the bus riser shaft due to inductive effect alone. This charge was tested and found to be as high as 180 amp. at a fractional millivolt rating. The situation was corrected by bonding the neutral to the metal enclosure at every floor level and thus draining the induced current.

L. W. Going, chief electrical inspector of Portland, comments as follows: "Presumably you are interested primarily in fairly provable or uncontrovertible factual data which will serve to illustrate bad field experiences from bad (?) wiring methods. I could probably answer your questionnaire much more readily and definitely if you were to inquire about good field experiences with good wiring methods. However, I shall try to be as helpful as possible.

"Our experience with stray or short-cut paths to ground taken by the natural current in conditions similar to bare neutral has been limited, because no such or similar conditions are allowed by the NE Code nor by the Portland Code. In England, however, practical difficulties were found to be such that this type of wiring has been almost wholly abandoned—just as it has been for marine wiring installations throughout the world.



Made by a reputable manufacturer, tested and listed by Underwriters, this switch nevertheless has not enough room for the heavy wire for which it is supposedly designed. Wiremen had to bend the heavy conductors with a hickey in order to get them in. Clearances are too small for safety. The job is a case of theoretical vs. actual field hazards

"A condition analagous to the bare neutral in interior wiring exists where only a few services are taken from a large secondary and one of these services is small as compared to the others but has a relatively good ground and is relatively near to the sources of the large secondary. We have found that such grounding wires and service grounded wires occasionally run hot due to shunt paths established around neutral conductor. This condition would, of course, be greatly aggravated if not made actually dangerous should the neutral conductor of secondary be opened (accidentally or otherwise).

"If a fire occurs, legal proof that it has occurred from such a cause is very difficult to obtain; but this does not make a careful code administrator willing to impose similar and possibly greater risks upon interior wiring generally. Such interior wiring consists of much smaller wires than service wires, and therefore offers many more chances of overheating and starting fires whose causes would be hidden and unpredictable.

Straying Not Permitted

"If a fire hazard can be shown to exist from stray currents from a bare neutral, then I believe we can and should legally require that the neutral current be kept in the designated and designed electrical channels and not allowed to stray from them to paths undesigned for any current or undesigned for so large currents as are allowed to stray along conductors, or from them, by baring of neutrals within a building. I do not believe that we should abandon our established code rule that all wires must have insulating coverings to prevent current leakage until we can be definitely assured that such omission of insulating covering will not result in a greater fire or personal injury risk from electrical causes.

"Concerning the inductive effects on surrounding metals in the structure, etc., from stray currents, our experience or factual evidence is not adequate to form the basis of any definite conclusion on this point; however, we are all familiar with what happens when alternating currents are not balanced by running the conductors of a circuit close together if there is metal near at hand in conductor enclosures or in the building structure. No doubt all branches of the electrical industry interested in good engineering will subscribe to the need of continuing in the code the requirement for the prevention of inductive effects from unbalanced alternating currents. Of course, if current along a grounded circuit wire is shared with metal, etc., along its route and appreciable amounts of current stray, there will be unbalance of current as between the conductors of a circuit, more or less reactance and heating of the conductors and of the metal surrounding or near them.

"Concerning radio interference from stray currents, I am of the opinion that any unbalance in an electrical circuit caused by the escape of current from any conductor may cause interference depending upon the nearness of the receiving antenna and the magnitude, or variation in the magnitude, of the stray current as caused by loose contacts, etc."

Price comments as follows:

"I have had several cases of stray current paths to ground taken by the neutral, and all cases investigated disclosed the wiring as armored cable and the trouble was caused by improper in-

stallation or faulty workmanship.

"While I have been told of a number of cases, I definitely know of but one recent case where induction was set up. The wiring method was knob and tube and paralleled just over a long run of abandoned gas pipe. The conductors were No. 8 rubber-covered and were overloaded about 50 per cent. The pipe was found to be very hot, indicating induction—in other words, a transformer of one turn."

Another inspector writes: "A considerable number of bare neutral services, range circuits and a very few CNX installations are in use in this city and so far have not experienced any difficulty with stray or shortcut paths to ground."

He also reports no inductive trouble or radio interference.

"It is logical to believe," says another city electrical engineer, "that troubles of the character mentioned would occur with the common usage of bare neutral wiring. Several cases of radio interference investigated indicate that such troubles would probably be materially increased by the general use of bare neutral wiring and the resulting stray or shortcut neutral paths to ground."

Mechanical Hazards

The other questions asked relate to mechanical hazards to various types of wiring as disclosed in the field. In answer to many of these questions the inspector merely stated that such wiring methods were not permitted in his city and no experience data were available.

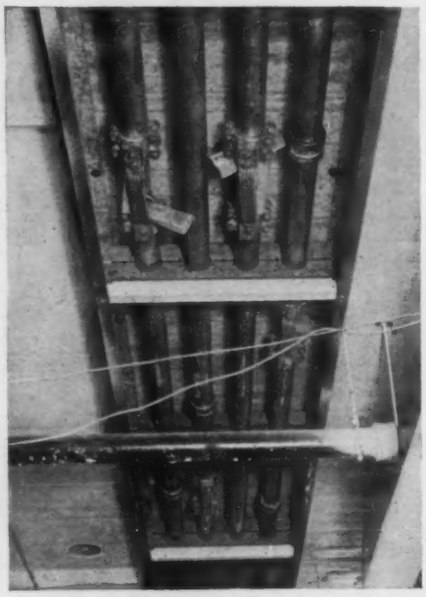
"There have been several cases reported of damage to electric metallic tubing during construction work," says another inspector. "Our observation has led us to the conclusion that some of the cheaper types of electric metallic tubing fittings are not dependable mechanically or as to electrical conductivity.

"On the whole, our experience with flexible metallic conduit has been reasonably satisfactory. It meets a real need under some conditions and we do not believe its use could properly be eliminated entirely as a wiring method." As to armored cable he says, "We have discovered some hidden splices and broken continuity of the armor in runs of armored cables. In a few cases the armor has been found connected for use as a circuit conductor when there was a break or an opening in one of the contained wires in the cable."

Another inspector says he has had no trouble to speak of, but says about the use of flexible metallic conduit, "Not so good to pull on long runs. No trouble with moisture or physical damage."

Otis W. Newcomb of Long Beach says, "Electrical metallic tubing has been used with entire satisfaction in buildings of frame construction for interior circuits and feeders only. Its use is prohibited for services and on exteriors of structures in this city."

Price writes, "I frequently encounter trouble with armored cable, nonmetallic sheathed cable and electric metallic tubing through construction and other similar hazards. I have encountered quite a few cases where the rough work was all right, and then carpenters drove nails through the conductors. I have noticed that the damage to electric metallic tubing was especially bad as carpenters appeared to be less careful with it than either armored cable or non-metallic sheathed cable. Threadless fittings have proved OK for conduit, but crimped connectors with electric metallic tubing caused much trouble. The crimping removes the interior protection and permits corrosion to set in. I have experienced a great many failures from these causes."



Neat and theoretically ideal is a bare-bus riser system such as this. But because the end housings of steel are charged by inductance, an unpredicted condition of current flow resulted and almost caused a tragedy

Of service entrance assemblies he says, "I have experienced only one failure in the past five years and that was caused by a splice pulled in the service conduit. Such fire should probably in no way be charged directly against the new sequence setup."

Youens reports, "Had one case of nail driven into service entrance cable, but would not condemn its use on that account. In spite of the amount of electric tubing used here so far we have learned of no construction troubles. We know of no serious threadless fitting troubles either electrical or mechanical, but poor workmanship could easily result in such difficulties just as it could with open wiring, armored cable or rigid conduit. We have so little use for flexible metallic conduit that we cannot refer to any experience with it. No, we have not contacted any case of improper splices in a run of armored cables. Those might get by, however, in the hands of laymen not calling for permits. We have had no detrimental mechanical installation experiences with these sequence arrangements or service entrance assemblies."

On the other hand, W. E. Brothers, city electrician of Berkeley, Calif., says that his experience with electric metallic tubing and armored cable is not very good. "Electric metallic tubing is not satisfactory for the reason that the threadless fittings get loose in attics and the same thing happens on tubing used for service when exposed to the sun outside the building. Because of expansion and contraction the fittings get loose and water gets into the tubes. Electric metallic tubing will rust in salt air more quickly than rigid conduit, and condulet fittings with zinc dust blown on them are one mass of rust in two years' time. They should be hot-dipped galvanized.

Fires and Armored Cable

"As to armored cable, we have had fires resulting from No. 14 wire in armored cable lighting circuits and in No. 6 wire armored cable range feeds. The cables develop shorts and cook for hours and even days before a fire breaks out. Steel tape wound around the wires in circles makes a choke coil out of the cable. The steel in this material seems to have a high resistance and will not blow the fuses when they are only 15 ft. away.

"Sequence socket meters have a neutral ground terminal in the meter base, and it is contrary to the National Electric Code to use a current carrying neutral to ground the meter frame."

Arthur Veit, chief electrical inspector for the County of Los Angeles, reports no experience with most of the difficulties enumerated. "To date we have had no report of trouble due to threadless fittings, but personally I feel that certain types in use are not very satisfactory from the standpoint of strength or continuity of grounding. This is merely my personal opinion, but I have made no actual tests, nor have had any actual experience with them."

Another inspector writes, "I do not believe as a principle in the use of conductor assemblies when the conductors have insulation of different types, such as exist in CNX cable. This would permit either through ignorance or by deliberate intent the impressing of 110 volts on the neutral whose insulation

is not designed for that voltage."

Wiley has this to say: "We have had a few cases of damage to cable assemblies, caused by the driving of nails through the cable after it has been concealed in the walls of the building. We have record of one particular case wherein the nail was driven through the grounded armor and into the ungrounded conductor, resulting in the service drop conductors burning off at the service head and falling into the street.

"At the present time, the use of armored conductors is not permitted in San Francisco because of the installation abuse that this material has been subjected to. In some cases the metal armor was used for the circuit conductor when one of the conductors of the cable became defective and because of the fairly high resistance of the cable, the circuit became heated, resulting in a potential fire hazard."

Crimp-on Fittings

"We have experienced some trouble with threadless fittings where a worn tool with the crimp-on type of fitting was used and poor workmanship with the compression type of fitting," says Gaffney. "The crimp-on type apparently causes rust if used where subject to moisture." He goes on to say that flexible metallic conduit proves satisfactory for certain installations when properly strapped.

J. H. Crannell, electrical inspector of Glendale, Calif., reports that nails have occasionally been driven through electric metallic tubing. He goes on to say, "I don't think the fittings are so hot. If not strapped properly the tubing will pull apart. We have had some cases of this nature. We have had trouble pulling in wire in electric metallic tubing but we do not use flexible conduit except in short pieces for motor connections where it is impossible to use conduit."

Speaking of the mechanical hazard, Going says, "The Portland Code does not recognize non-metallic cable assemblies for interior wiring purposes. The damage to non-metallic cables from construction hazards therefore has been nil in Portland. We do not permit its installation in new concrete construction and buildings in course of erection. Our experience with threadless fittings, both as to electrical conductivity and mechanical durability of the conduit or tubing system using these fittings, has been good where the installation has been made by careful and competent wiremen. We have had cases, however, where these fittings have been carelessly installed or, in the case of certain sleeve-type connectors, improperly crimped because of dull tools or poor workmanship. Thus the tubing is caused to pull apart in concealed spaces when the conductors are being drawn in.

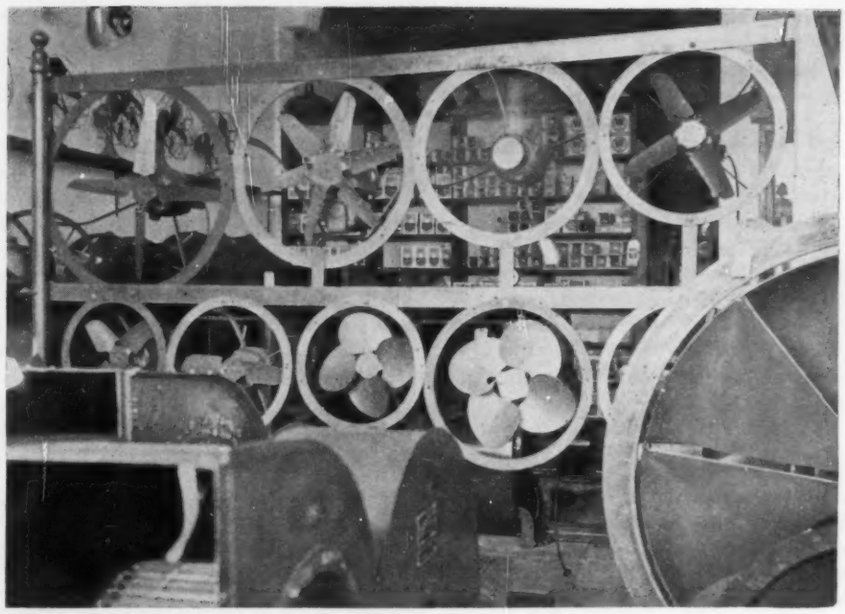
"Concerning sag in flexible metallic conduit, we have had cases where the flexible conduit has been pulled loose from box connectors in fished jobs and due to friction of pulling in the conductors through inadequately secured flexible conduit systems.

Unlawful Work

"We occasionally find armored cable runs broken for the purpose of tapping illegal circuit extensions—mostly by unlicensed persons or by persons unfamiliar with electrical construction methods.

"Early experience with new sequence metering has shown the necessity for preventing moisture accumulation in the service raceways and in meter sockets due to condensation or weather conditions. Several burnouts occurred locally because of failure to guard against these conditions; however, these burnouts have been almost entirely eliminated by change installation methods and meter socket design."

A philosophy that caution in the adoption of new and untried methods is a policy that pays is well expressed by Crannell when he concludes, "We have very little trouble of any kind, due to the material we use and the cooperation of electrical contractors and journeymen wiremen. Everybody tries to do the best work possible. Some people think that, because they can use any old material or do any kind of work in some of our larger cities, they are being penalized here; but such is not the case. They are getting more for their money here than anywhere I know in the state."



Demonstration is essential to selling fans, as it is with appliances. Smallcomb uses this rack to show various types of fans. Facilities to demonstrate all the types in stock are maintained on the sales floor

Fan & Blower Facts

Ventilation has a good market, but its problems are tough

By CLARE T. SMALLCOMB
Smallcomb Electric Co., Los Angeles

In spite of all the publicity given to air conditioning, just plain ventilation still has a good market for the contractor who will study the problem and take the pains to learn some of the practical aspects of air movement. Where the contractor does not care to go into ventilation that thoroughly, he should work with a contractor who has done so, at least on the ventilation part of the job; otherwise, he is apt to run into practical difficulties not mentioned in the books. Selling and installing air moving equipment for the last eighteen years has taught me that there are intricacies that can't be found in books. What may appear to the novice to be the simplest kind of fan or blower installation may demand the most complicated series of ducts and very special equipment to accomplish the desired results.

Pitfalls avoided as the years go by are discovered by experience that is costly in both dollars and headaches. But from it comes knowledge that makes it easier for a contractor to serve customers who rely on him to solve ventilation problems. And there are ten ventilation prospects to every air conditioning job. Whether it be kitchen or attic ventilation in the home; restaurant ventilation and air circulation; ventilation for the private office, for auditoriums, conservatories, hotels,

mattress factories, cement plants, cotton mills, lumber mills, coffee, chemical and paint manufacturing plants, spray booths, mines, tunnels, etc., each job has its own particular problem. If a contractor does not learn what that problem is, the chances are that he will have to learn the hard way, as we did, by assuming the expense of tearing out and changing equipment.

Fans, for instance, may move air and yet be too noisy; or they may be quiet and not move enough air. Either one can get you into a mess of trouble when a customer "wants what he wants."

No Noise or Else

Small fans with high-speed motors can be used when noise is no item, but many times this type of fan is installed in a conference room by inexperienced ventilation engineers—much to the annoyance of the conferees and to the sorrow of the "engineer". You just simply charge that up to experience and if you are an up-and-coming ventilation expert you won't do it again.

Or on the next job of the same kind you may install a larger fan with a slower speed motor and everything is "hotsy totsy" in the conference room, but over in the president's office 50 ft. away a terrible growling noise is heard. Although some of the sound may be coming from the president, most of it is coming from the fan motor, which, because of one or more reasons, is vibrating. "Iron noise," we call it; and while it is not apparent in the immediate vicinity, it magnifies and travels through the building structure and becomes obnoxious, even unbearable to the high-strung president. Result: the contractor eliminates the noise or else.

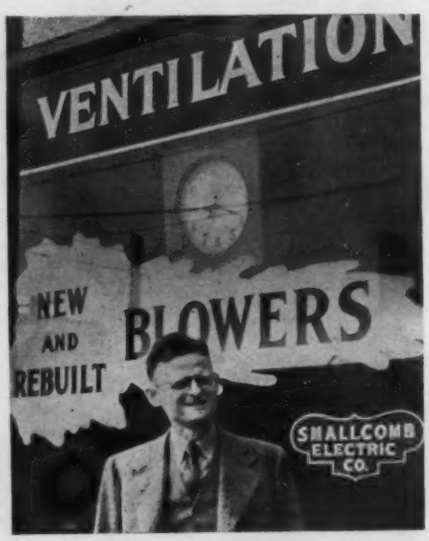
So it goes. You do not run out of things that can happen on the best engineered jobs. That is why I am leaving air conditioning alone at present until some of the bugs are taken out of it. We come on many air conditioning jobs, however, in handling the air movement end of the installation; but after you have been in the game as long as we have you just sort of sneak up on the job from all angles before you ever let out a peep to your customer that you are ready to go to work.

Now as to blowers, those pieces of equipment that take up the job of moving air through ducts where fans leave off: If anyone thinks a fan installation is involved, blowers will give him a chance to step from the frying pan into the fire and get a quick impression of what troubles really are.

Because there are so many uses for blowers and so many specially designed blowers for each particular kind of application, the average fan man had better steer clear of this type of ventilation unless he is willing and able to absorb punshment far beyond the remotest expectations.

There are good business prospects in blower installations if the uses and materials to be blown are studied and, often, tried out beforehand. We have sold blowers to supply air hundreds of feet into mines, for large duct systems in buildings and factories, to raise coffee beans into containers 30 ft. off the ground by a vacuum process, for furnaces, for syphon systems, for chemical plants. All require different types of wheels, housings and motors. It can be appreciated that selling and installing blowers is a complicated trade and requires more care, more study, more experience.

Our experience in this field over a



C. T. Smallcomb (in front of his shop) is a believer in advertising, and makes extensive use of it, both on the building and in mailings

long period of years has shown us what a contractor must do to build up a satisfactory blower and fan business. We have found, for example, that it is profitable for us to handle a line of cheap exhaust fans for a low-priced, small-business market that exists in our territory. We handle a higher grade of fan line for customers who want better performance and durability. We also do a wholesale business for other contractors whose fan and blower business is only an occasional call. They bring us in on the job to help with the sale and installation. As contractors ourselves, we know what another contractor wants of his supplier protection and a guarantee behind the equipment, and we enjoy a growing business from fellow contractors because we handle their accounts in this way.

Likewise we have found it profitable to rebuild and guarantee blowers which we recondition. Our calls for rebuilt equipment have necessitated going out of the state to replenish a stock which we try to keep the largest in our territory. In overhauling blowers, even as in rewinding and reconditioning motors, we have found it pays to spare no expense in doing a thorough job so that we can give the same guarantee on rebuilt equipment as we do on new.

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Wiring Doings

How organizations in the West are promoting adequate wiring

By W. A. HOPPER
Gem State Electric Co., Boise, Ida.

Probably nowhere in the country has the necessity for adequate wiring promotion been greater than in southern Idaho. There are two reasons for this: First, this is a large geographical area with a scattered rural population and small towns—which means that much of the wiring is done by "haywire" mechanics who do not know the difference between a watt and a bull calf. Second, we have one of the most aggressive utilities in the business, particularly when it comes to loadbuilding. With its low residential combination rates this utility has built loads to the point where any residence wired even two years ago is short on copper and outlets.

Something had to be done to boost wiring. Even in larger cities like Boise, Twin Falls and Pocatello conditions were bad. Work was going to the lowest bidder and the contractor sold nothing but a price. Few ever tried to see how good a job could be sold, but only how cheap.

The First Meeting

Realizing the inadequacy of wiring, the Idaho Power Co. called on several of the contractors in Boise, Caldwell and Twin Falls and suggested that we start something — just what no one seemed to know. It looked hopeless because of the local and inter-city cutthroat competition and old animosities. But we canvassed the possibilities and decided to try an educational program. That was last fall. A date was set and a meeting called in Boise. The original invitation came through the Boise City Inspection Dept.

About 100 attended the session. And the big surprise was that everyone was ready and willing to try. A loose organization was formed and a program of education launched. For want of any set or prepared schedule, a study of the new edition of the National Electrical Code was chosen. Likewise it was decided to study the possibilities for adequate wiring promotion as outlined in the Handbook of Interior Wiring Design. A schedule of twelve weekly lessons was set and each indi-

vidual charged a $2 fee. Instruction expense was shared through the office of the Idaho State Vocational Education Dept. under the Smith-Hughes Act.

Distances in Idaho are great and as the class was too large to handle, it was split into two groups, one at Boise, the other at Payette. Two weeks later classes were organized at Twin Falls and Pocatello. A total membership of about 200 was enrolled in the four classes. Meetings were held in the evening and lasted about two hours. A part of each meeting was devoted to a lecture or talk, sometimes illustrated. Subjects were varied: estimating, business practices, accounting, the architect's viewpoint, showing of modern wiring devices, lighting equipment, advertising, etc. Most time at a meeting was devoted, however, to study and to questions and answers on the code.

After completion of the course there was held a general meeting at which A. E. Schanuel, field representative of the National Adequate Wiring Bureau, was present. At this meeting a permanent organization was set up for purposes of promoting adequate wiring and for the general good of the contracting branch of the industry. Another series of classes was voted and is scheduled to begin this fall.

Total result of our effort is not completely encouraging. It early became evident that to educate a bunch of electrical contractors and their employees is difficult, if not next to impossible. At the present it seems wiser to educate the public to a demand for adequate wiring to such an extent that it will ask for an adequate job and not a price. Much good did result, nevertheless. The industry in southern Idaho as a whole is more harmonious. We can all get into one room, and if you searched you would not find a single gun. Contractors already find it easier to sell an owner a real job. Architects are showing more willingness to raise the standard in their specifications and to place more outlets in the plans.

Wanted: Assistance

In order to continue this activity successfully, however, we need help: Will someone tell us where we can obtain a course of study adapted to our purpose? Although there is much that can be said about adequate wiring, we feel that this is all well-known to the trade in this area. We require something a bit more advanced.

Other sections of the West are carrying on wiring programs as reported below by the persons concerned:

Electrical League of Utah has appointed a special adequate wiring committee to organize the National Adequate Wiring promotion and fit it to local situations. A minimum certified adequate wiring requirement, as well as an application to operate a certification plan, has been prepared by this committee and forwarded to the bureau in New York.

On this committee are Harry Hall, Capital Electric Co., chairman; C. A. Wolfrom, Utah Power & Light Co.; D. M. Salsbury, Westinghouse Electric Supply Co.; J. Vernon Sharp, Sharp Electric Co.; Blaine Grey, Salt Lake City electrical inspector, and Elias Strong, manager of the electrical league.

Spokane proved to be ready and waiting for the National Adequate Wiring program when A. E. Schanuel met with the committee there recently. A local Adequate Wiring Bureau had been elected. R. J. Franks, Maxwell & Franks, electrical contractors, is chairman; Charles H. Barrett, vice-chairman; H. C. Bender, Washington Water Power Co., secretary-treasurer. The board of directors includes Warren Oliver and Neil Nolan, contractors;

F. J. Airey (left), chairman of the PCEA'S Red Seal committee, talks things over with A. E. Schanuel, field representative of the National Adequate Wiring Bureau

Verne McCain, wholesaler, and Kellogg Finley, utility.

Southern California has begun operation under a certification program affiliated with the National Adequate Wiring Bureau. On a leaflet the size of an envelope stuffer the minimum requirements and recommendations for adequate wiring certification were issued by the Electrical Development League of Southern California and are now in circulation among the trade. The requirements call for a main service of not less than 1½-in. conduit with three No. 2 wires. This provides not only for range and water heater but also for auxiliary or complete air heating.

Aside from the minimum requirements, a number of recommendations for additional adequacy features are included in the list. Walter Stickel, as league director of the department on adequate wiring design, is administering the program. Certification is to be done through the utility except in the City of Los Angeles where the city electrical inspector's office will be relied upon for certification of the wiring. In splitting up the responsibility under the league operation, utilities will contact appliance dealers and the general public. Wholesalers will be responsible for working with electrical contractors. The league will carry the message of adequate wiring to the architects and building contractors. In Southern California Edison Co.'s territory the bureau will carry on with California Red Seal certification. This will be coordinated closely with the national program.

100 Prospects

At the recent Southern California home show the league put on a display and made use of the sound-slide film, "Power for Living". Over 100 actual prospects for adequately wired homes were obtained from this showing.

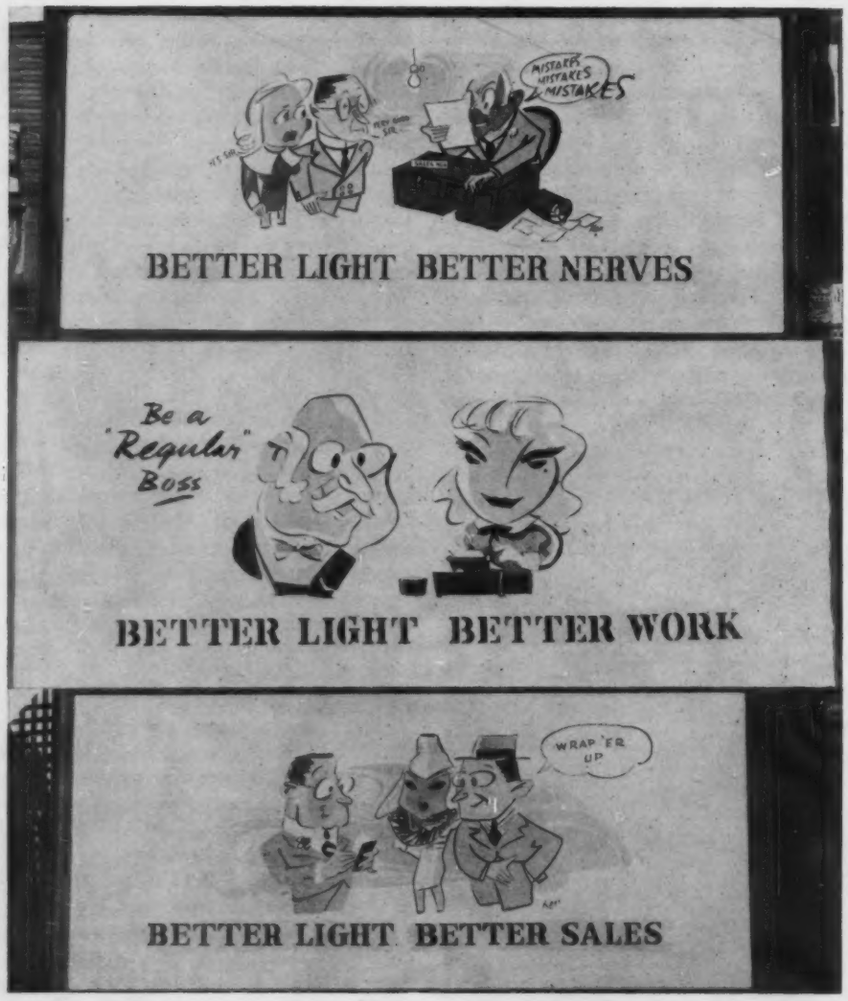
In Montana work is progressing toward formation of adequate wiring bureaus under the general direction of R. E. McDonough, Montana Power Co. Following meetings at Boise, Butte, Billings and Missoula, addressed by A. E. Schanuel, preliminary organization work was begun.

Seattle's adequate wiring program welcomed the advent of the national program as an answer to a difficult local situation. J. J. Agutter, electrical contractor, chairman of the local electrical industry promotion committee, had been seeking an adequate plan for Seattle to be operated by the Electric Club of Washington. The adequate program was adopted and is being organized for the State of Washington west of the Cascades. Committees of the Electric Club of Washington are handling the details. Preliminary steps for organization of an adequate wiring program in Portland were taken after Schanuel's visit. Conferences between executives of Portland General Electric Co. and Northwestern Electric Co. are being held, and a local adequate wiring committee was appointed to work out details for the Portland area.

Rocky Mountain Electrical League, a pioneer in adequate wiring promotion and a veteran in the Red Seal plan, has coordinated its Red Seal promotion with that of the National Adequate Wiring program and is continuing a joint effort so as to take advantage of publicity for the new program and the established reputation of the Red Seal program.

Northern and central California, long operating under the Red Seal Adequate Wiring program, will continue with that activity but will seek to coordinate it with the national program's publicity material.

"Please, Boss, Give Us Better Light"



B. C. Electric Railway Co. has gone to the billboards in a campaign to stimulate commercial lighting sales. The approach is unique—an appeal in the name of the rank and file employee for better office and store lighting. The domestic Better Light-Better Sight campaign has met with such success that the B. C. Electric advertising department felt that a similar attack might make the way easier for the commercial lighting salesmen. Result is the series of billboards pictured above. The artwork is in the modern vogue; the copy simple, direct and meaningful. If comments from customers mean anything, the series has made the salesman's approach to the prospect easier by arousing real interest

Air Conditioning

Fifty-three displays crowd Los Angeles show into a tent

Air conditioning held the stage in southern California last month. For four days the Thermo Air Conditioning Institute building in Los Angeles was crowded with prospective buyers attending the city's first Air Conditioning, Cooling & Heating Show.

What the visitors—several thousands of them—saw were 53 displays embracing the products of almost every nationally known manufacturer and requiring so much floor space that they spilled out of the building into an adjacent tent. More than 10,000 sq. ft., to be exact, were occupied; and this does not account for the exhibiting in front of the building of an air-conditioned bus and portable airplane air conditioner.

Staging of the show was the cooperative action of seven organizations: the Air Conditioning & Refrigeration Assn. of Southern California, Southern California Chapter of the American Society of Heating & Ventilating Engineers, Electrical Development League, Los Angeles Bureau of Power & Light, Los Angeles Chamber of Commerce, Southern California Edison Co. and the Thermo Institute.

The committee in charge was headed by Howard H. Douglas, Edison Company, and included Ben B. Breslow, Utility Fan Corp.; W. E. Cranston Jr., Thermador Mfg. Co.; Ivan deJongh, deJongh-Howells Corp.; E. C. Flynn, Payne Furnace & Supply Co., Inc.; H. F. Haldeman, H. F. Haldeman, Inc.; George Hartman, Hartman Engineering Co.; F. L. Hockensmith, Development League; W. W. Sanford, Thermo Institute; Earl S. Anderson, Chamber of Commerce; Edward H. Kendall, English & Lauer, Inc.; W. W. Pearce, Bureau of Power & Light; Dr. Frederick Pernot, Pernot & Rich, Inc.; W. A. Pruitt, Air Conditioning & Refrigeration Assn.; Emmett Quinn, Pacific Fruit Express, and A. B. Wicks, Los Angeles Dept. of Building & Safety.

Smaller—it was sponsored by 40 firms and included 24 exhibits—but of equal value because it helped to arouse public consciousness in the Northwest was the Spokane Air Conditioning Show held in the Spokane Hotel late in June. Chairman was David Knapp, Great Western Fuel Co.; manager, H. C. Bender, Washington Water Power Co.

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Ad Awards

Western utilities' advertising is honored in contest

Pacific Coast power companies won their share of awards in the Public Utilities Advertising Assn.'s contests for 1938. Pacific Gas and Electric Co. won the premier award in the classification covering public relations newspaper advertising with a piece of copy featuring its $1,549,000 tax payment to the City and County of San Francisco.

Second prize in a special award for copy excellence went to B. C. Electric Railway Co. In the direct mail advertising contest P. G. & E. won second prize with its "Homebuilders' Idea Book." In radio advertising first prize went to Southern California Edison Co. for "The Woman's Forum," a program sponsored on the air by the Electric Home Institute of Southern California, the name under which Edison has conducted its radio activities since 1934. Surveys have shown that this program consistently had more listners than any other program aired at the same time and also had more listeners than any other local programs of the same type.

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Discovery Month

Such is the name given October by the Modern Kitchen Bureau

Capitalizing on the fact that more than 1,000,000 electric water heaters are now in use, the National Electric Water Heating Council of the Modern Kitchen Bureau has set aside the month of October as "discovery month." Prospects everywhere will be invited at that time to discover for themselves "what

a million users of electric water heaters have discovered."

To help salesmen during the drive, the council has prepared a special selling guide which can be used by the salesman to organize a forceful story or can be given to the prospect to read for himself.

Details of the program are outlined in the bureau's dealer broadsides, first of which will be mailed this month.

Similar in almost every respect is the bureau's fall range program. October will be "discovery month"; slogan, "Electric Cooking Costs One-half What You Think." One original feature calls for retail salesmen to visit homes where electric ranges are in operation, there to get the actual bills that show economy. Those bill will be used to clinch sales.

In both drives, August and September have been set aside as a preparation period; October as the period for intensive sales effort.

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Press Applause

A B.C. appliance store's publicity stunt gets free space

When a publicity stunt draws free space in local newspapers then it must be good. Excellent, therefore, was the "Radio Broadcast," presented by Art's Electrical Service, Nanaimo, B. C., which recently intrigued the press into considerable comment and so packed the store building that many people were turned away.

The program, consisting of orchestral, instrumental and vocal renditions by local artists and staged with studio and technical equipment in operation in full view of the audience, was rebroadcast from several radios in the building. Second part of the program was an amateur hour with prizes for winning artists.

Admission was by tickets obtainable at the store. This, of course, meant that the appliances arranged in the hall and entrance lobby were twice seen by prospective customers—on picking up the tickets and on attending the broadcast proper.

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Future Campaigns

More about what is being done to sell appliances in the West

Following dealer-utility campaigns and special events have been scheduled for the next several months:

B. C. Electric Railway Co.—From Aug. 29 to Sept. 5 the company will have a large merchandise and agricultural department display at the Vancouver Exposition. During September it will conduct a follow-up campaign on all major appliance prospects obtained at the exhibition.

Coast Counties Gas & Electric Co.—August, roaster and water heater campaigns.

Idaho Power Co.—Started in July and continuing through August is a range and water heater campaign in honor of new President C. J. Strike. Mazda lamps, IES lamps and major appliances will be featured in September.

La Veta (Colo.) Light, Heat & Power Co.—August, refrigerator campaign.

Los Angeles Bureau of Power & Light—August and September, range campaign in which fifteen manufacturers will cooperate. Campaign will stress the fact that cost of operation of a range is only $2.96 per month. Ranges will be sold for as little as 5 per cent down and five years to pay.

Mountain States Power Co., Casper, Wyo.—September, light bulb campaign.

New Mexico Public Utilities Corp.—August and September, adequate wiring campaign.

Pacific Power & Light Co.—August and September, kitchen modernization campaign.

Pacific Gas and Electric Co.—Started May 1 and ending Sept. 22 is a range and water heater campaign on company direct sales only. Winners will get a trip to a dude ranch.

Public Service Co. of Colorado—August, campaigns on refrigerators, kitchen modernization, vacuum cleaners, light bulbs and IES lamps. September, same except for substitution of roasters for cleaners. Incandescent bulbs will be sold in eight-lamp home assortments. Company expects to sell 40,000 bulbs averaging 65½ watts each.

Puget Sound Power & Light Co.—August and September, range, water heater and refrigerator campaigns.

Rawlins (Wyo.) Electric Co.—August and September, light conditioning campaign.

San Diego Bureau of Radio & Electrical Appliances—Refrigeration advertising, mostly in newspapers, will be continued in August. Laundry equipment program is planned for September.

Southern California Edison Co.—Company will have an exhibit at the Pomona Fair in September.

Southern Colorado Power Co.—August, range and water heater campaigns. September, range, water heater, roaster and IES lamp campaigns.

Southwestern Public Service Co.—August, range and variety lights campaigns. September IES lamp campaign.

Utah Power & Light Co.—August, cam-

Because Henry Levy Furniture Co., Santa Barbara, Calif., Hotpoint dealer, won first prize for the department store group in the National Kitchen Modernization Bureau's window display contest, H. D. Conklin (right), manager of the Pacific Southwest district, Edison G.E. Appliance Co., presents a check, duplicating the bureau's check, to Milton F. Spitz, treasurer of the furniture company. The winning display featured Hotpoint equipment

Eye-Catching, Pedestrian-Stopping Display

An unusual window display will always attract a crowd. If you need further proof, see above. Pedestrians stopped, stared and entered the store for more information when B. C. Electric Railway Co. presented an exhibition of blindfold ironing in one of its store windows during the recent Home Laundry Week

Selling Appliances—How Store-Layout Helps

Many are the merchandising ideas and conveniences in the new store of Collonan Electric Co., San Francisco.

Top left: Electric outlets are provided for every conceivable purpose. This picture shows four outlets at different levels. In the floor (immediate foreground) is an outlet used in demonstrating appliances in the center of the room. Duplex outlets are located on the baseboard, just above the display cases and above the picture molding.

Second left: One of the display counters built along each side of the store for small appliances. Space above the glass shelves is used for displaying lighting fixtures (entire ceiling is similarly used). Mirrored backs to the shelves give the store an impression of depth. Near the front, control panels employing circuit breaker switches in a large cabinet give individual control to almost every lighting unit and convenience outlet in the store.

Third left: Office of Store Manager Ed Conroy is situated on the mezzanine just above and to the rear of the store. A window at floor level permits Conroy to watch activties on the main floor.

Bottom left: Compact lamp and wrapping counter. Lamp stock is kept handy to the wrapping materials. Also available, because this is the receiving point for appliances to be repaired, are test facilities for both lamps and appliances.

Above: Sundries are displayed, dust-free, in this case, built on an angle, divided by adjustable metal partitions and covered by sliding glass windows.

Bottom: At the rear of the store, Owner Cornelius Collonan (pictured) holds forth.

paigns on water heaters, ranges, refrigerators, lamps, small appliances and floodlighting. September, campaigns on lamp bulbs, portable lamps, major appliances.

Valley Electrical Supply Co. (San Joaquin Light & Power Co.)—August, laundry equipment campaign. September, lighting campaign. The company will exhibit at the Santa Maria Fair.

Western Public Service Co., Laramie, Wyo., and Las Animas, Colo.—August, roaster campaign. September, pin-it-up lamps and kitchen lighting units campaigns.

Denver Electrical League—August and September, kitchen modernization, lighting, adequate wiring, refrigerator and IES lamp campaigns.

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Sales Shorts

Trailer store; refrigeration campaign; crusade; Reddy Kw.; etc.

BEST WAY TO DO a big appliance business is to go out after it. So decided Schoss Electric Co., Salt Lake City, the first of this year. As a result the store has now put into operation a specially built trailer store equipped with loudspeakers and large enough to house a washer, refrigerator, range, ironer, radio and two vacuums. Sides of the trailer drop down thus enabling prospects either to look in as through a show window or to walk inside and inspect merchandise at close range.

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NORTHWESTERN ELECTRIC CO.'s all-dealer refrigeration campaign this year was extensively advertised via 36 newspapers and radio. In the Portland papers the company used three-color ads in large space. According to James B. Buman, manager of residential and rural sales, refrigerator sales have held up well largely as a result of the campaign.

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NATIONAL SALESMEN'S CRUSADE, tested by Nash-Kelvinator Corp. in Lincoln, Neb., with exceedingly successful results, spread through the West like wildfire last month. Virtually every major city from border to border and coast to mountains was involved in the campaign to sell America out of the depression.

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EL PASO (TEX.) ELECTRIC CO. is said to be the first electric company to use Reddy Kilowatt in all types of stores—grocery, drug, department, bakery, etc.—in a city-wide or system-wide activity. The claim is based on Reddy's appearance in connection with a June-July dealer cooperative campaign on electric roasters. So successful were results that the company plans to use Reddy in the promotion of its transportation system.

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TOTAL ATTENDANCE at the electrical expositions and demonstrations of electric cookery in Butte and Great Falls, Mont., was over 11,000. Dealers exhibiting in the Butte show sold $3,780 worth of appliances.

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BLUE RIBBON is the name of the line of lamps awarded prizes in the recent Lamp Design Contest held by the American Institute of Architects, American Institute of Decorators and Illuminating Engineering Society and sponsored by *Interior Design and Deco-*

ELECTRICAL WEST

Appliance Sales Guide

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Get the factory demonstrator to teach every member of the organization how to iron with apparent ease and skill

Ironers . .

Sell best when demonstrated

There are still from 6 to 9 times as many washers in use as ironers. To sell this big potential market has not proved easy so far. A group of merchandising experts dug into the problem recently and came out with these recommendations to dealers and salesmen who want to make money in ironers:

1. Dealer training classes to develop ways to promote, demonstrate, and sell ironers.

2. Teach every salesperson to iron with ease and skill—make it look easy to do.

3. Constant demonstration in the store.

4. Arrange for demonstrations in the home. This was necessary originally to sell washing machines, sewing machines, etc. It is necessary to sell ironers.

5. Advertise the *benefits* to be had from an ironer; never mind the mechanism.

6. Learn to dramatize the sale—act out the contrast between the tired woman doing ironing by hand, and the rested woman seated comfortably and always presentable.

7. Organize home laundry schools, just as cooking schools were handled. Answer questions, demonstrate, show short cuts and labor saving laundry ideas, removal of stains, spots, etc., pressing, pleating, and shaping of knitted wear.

8. Follow through after the sale and teach the purchaser how to use. She can kill more future sales than you can make if she fails to get full satisfaction from its use. She can be an enthusiastic volunteer salesman when she is successful and happy about her purchase.

Simple Demonstration Method

If a customer stops to watch an ironing demonstration, the salesperson should ask casually whether she owns a washer. If she does, add smilingly, "Then you have lots of ironing to do every week, don't you?" Ask the prospect to be seated and watch, then say, "That's more comfortable, when you've been standing and walking, isn't it. That's the nicest thing about an ironer, you can be seated comfortably while doing it." Ask whether shirts are her biggest item or lots of children's clothes. Then whichever she answers, take a similar article from the wash basket and say, "Let me show you how easily you can iron a (child's dress or shirt) and do it comfortably while sitting down instead of standing on tired feet, with the heat of the iron rising into your face." As you iron the article talk of the benefits of an ironer and only mention the ironer details as a proof of some benefit, for instance: "Even the last piece you iron is as nicely finished as the first, because you aren't tired, and because the machine exerts a uniform pressure far greater than you could, all during the ironing." Before finishing the article, arise and ask the prospect to take your chair and finish it. Say smilingly, "I know everything always looks hard when someone else is doing it. I want you to sit down and finish this and see how really easy it is." Explain the controls, and as she irons, after asking her if that isn't a more pleasant way to iron, explain the terms, and ask her if she would like to have it for next wash day.

Washers . .

Stay with fundamentals

Probably what ails washer sales is that dealers and salesmen have grown weary with the simple, fundamental story of washing machine benefits and are neglecting to tell it convincingly if at all, forgetting that their prospects may never have heard it, or if so, have forgotten it. Yet it is this simple, basic story of what a washer will do for a woman, how it will save her time, money, clothes, and physical energy, that really appeals. Trick features and gadgets, and low competitive prices interest her only because few salesmen bring to her attention the other reasons for purchasing. (See the lists inside.) But there is still profit to be made by selling-up to better quality washers by thorough demonstration and a sales story that brings forth all of the advantages of owning and using a washer.

If the volume and prevailing price level do not encourage each salesman to do a thorough demonstration, an excellent idea is to hire a woman who has time to spare from her home and is proficient in the use of a washer, to follow up each sale and to help the new user to get the most out of her purchase. She can bring back many live prospects for future sales.

But since recent experience has proved that vacuum cleaner salesmen can still go from house to house, giving a thorough demonstration and a carefully rehearsed and dramatized sales talk and sell high priced articles just as were done in the early days. the same can still be done with washers. Remember, there are thousands of new brides every year who were only kids when their mother bought a washing machine. They have not been sold a high grade washer. When they decide they need one they go about shopping on the only basis they know—*price*.

It still pays to *sell*—try it.

Place ironer with open end toward traffic in the store. In this manner, operations on it are easily observed and the demonstration attracts more prospects. An extra chair for the prospect is also a good idea

August 1938

Electric Home Laundry

. . . When the

Like hand irons, washers can be sold in any market, in fact, the last depression proved that washers were in greater demand than ever. But because they are so well accepted, the salesman runs into the same danger that an overconfident athlete does—he may neglect to try hard enough to make the sale of a better model and be too easily satisfied to sell the lowest priced model. Or he may assume too much—that his prospect knows all the advantages to be gained by using a washer and that it is a waste of time to repeat them. He may neglect a demonstration, thinking it unnecessary, but demonstrations always help to keep the washer sold, to answer a multitude of questions that must be satisfied in order to make the sale last. Resistance to the sale of a washer usually comes from:

1. **The price—(she wants to shop around more).**
2. **Confusion over gadget appeals made by other stores in which she has shopped.**

In the next two columns are a reminder list of the advantages and benefits of owning and using a washing machine and ironer. They are your ammunition to use in overcoming all kinds of resistances, as illustrated by examples on the facing page.

Chief resistances met in the sale of an ironer spring from some variation of the following:

3. **Afraid it would take too long to learn to do all the ironing on it.**
4. **Feels it would be extravagant.**
5. **Isn't convinced it will do fancy things that take time, and she doesn't iron enough flat things to justify an ironer.**
6. **Really hopes to be able to send all laundry out or have a maid do it and hence does not want to put in an investment she feels would obligate her to do all the home laundry.**

Meet these difficult obstacles as suggested on the facing page, using the advantage points listed in the next column.

Washer

Clean clothing, whenever needed or wanted irrespective of laundry deliveries.

Less investment in clothes, since they can be washed oftener if need be.

Children's clothes not outgrown because they are used and worn more while they still fit.

Clothes last longer because of gentler treatment in home washing.

Particular care can be given to special garments like lingerie or colored clothes.

Saving in costs, for despite claims, home laundering costs less.

Relief from backbreak over a scrubbing board, for the machine does the heavy work.

Saves time on washdays, and the washing can be done and out of the way early.

Time for other activities, either around home or out-of-doors.

No loss of treasured articles or costly garments, for they never leave home.

Pride in the modern, well equipped home, with labor-saving devices.

Always ready for emergencies, such as caused by lots of company, or illness, or summer play that requires so many changes of cool play clothes.

Weak spots or worn garments can be especially favored and made to last longer.

Overalls and work clothes of husband can always look neat and be clean, making a better impression and giving him a sense of pride in appearance.

Pump Equipped

Saves lifting and carrying of water by emptying the tub quickly, and thus saves more time and energy too.

Spinner Models

Gentler on clothes, easier on buttons and other trimmings.

Blankets and pillows can be washed more easily and dried more quickly. Savings in home laundered blankets.

Utmost in safety and most efficient in the extraction of water from garments. They can be ironed right away if need be.

Tray Washer

Save more space on a crowded laundry porch since tray washer fits right over one laundry tray **Saves one handling** of water. Just turn faucet to fill, pull stopper to drain.

So handy to do just a few things anytime, as it is always set up to do some washing.

A few things every day and there is no accumulation for a big wash day.

Renters find it easier to move with them.

Ironer

Saves money in laundry bills, in clothing investment, in home pressing.

Less wear and tear on clothing, because less straining of clothes

Presses suits, pleated skirts, shapes sweaters, knitted wear, velvets, etc., in professional way at a saving.

Shrinks yardage before dressmaking and saves here too.

Wet wash or rough dry laundry service can be used and ironing done easily at home at a saving in cost.

Sit comfortably while you iron. (Some women even get expert enough to read while ironing.)

Saves lifting of iron and thus conserves energy.

Saves the feet from long tiresome standing.

You are always presentable and comfortable in case someone drops in unexpectedly while you iron, instead of looking hot and bedraggled.

Keep cool because the heat rises away from the face.

Linens look crisp and glossy.

Curtains hang straighter, are easier to iron because of large surface of shoe.

Less starch needed, prevents easy scorching.

Moth larvae killed by running woolens through heat.

Prospect Says: "NO"

NO. 8B

ELECTRIC HOME LAUNDRY

Combine **Advantages** to Meet **Obstacles**

1. **Price**—"Yes, it is true there are lower priced models on sale. And you would not be a prudent buyer if you did not consider them. Yet what you really want, when all is said, is full value for your money, isn't it? You want a machine that will assure you clean clothes when needed, that makes you independent of laundry delivery days. You want to save on your investment in clothes, make them last longer, give special care to lingerie and many prized articles you wash even now to protect them. And you want such quality built into the washer that you can forget the original investment and know that it will be serving you for years without any additional cost or worry. Why not get the decision over with and begin to enjoy the use of this washer immediately? Do you always wash on Monday? I can get it to you in plenty of time."

2. **Confused**—"Really, I don't blame you for being confused a bit by all the special features offered with each make. Naturally every manufacturer tries to have some special gadget to appeal. Yet after all, what you want is not the washer itself so much as it is the service it will perform for you. You want to make your investment in clothing last longer, to be able to be neat and clean with a smaller investment in clothes because you can wash them as often as you like without effort or fatigue. You want sanitary washing under your own scrutiny and care, you want to be able to give care to special articles you prize, to be free from possibility of loss. Why not end all the confusion by deciding right now on this model and be relieved of the problem for years to come."

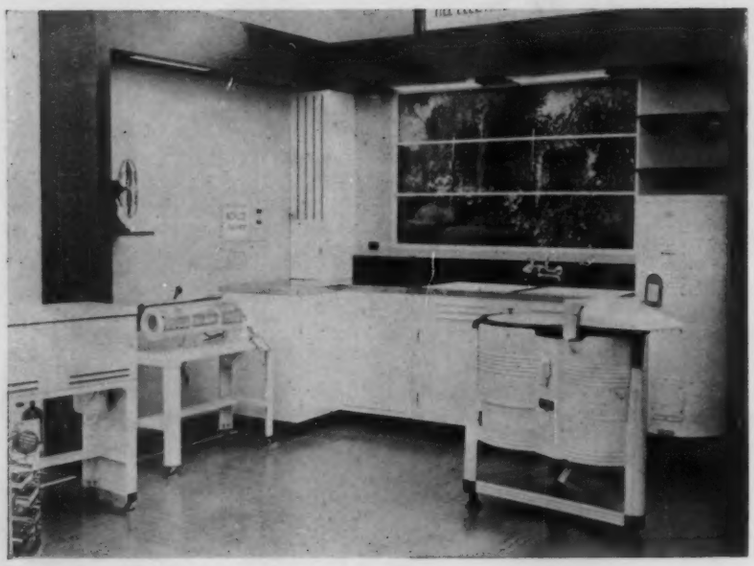
3. **"Too long to learn?** I can appreciate that is an important matter. Yet when you consider that we have taught little girls, and even blind people to operate an ironer safely and skillfully, I am sure that you would find it very easy. Of course, like learning to drive a car the first time, it does take practice for awhile, and your first attempts may not satisfy you, but every time you use an ironer it will prove easier. All my customers have found that. And it is such a relief not to have to stand up and push and lift an iron. Why not begin with a few simple things. I am sure you will be trying something a little more difficult and soon become proficient. Why I even have customers who read while they iron. That makes work a pleasure. Suppose we deliver this model and you try your hand at it?"

4. **Extravagant**—"I think I know what makes you hesitate. You do not wish to seem extravagant, perhaps you wonder if an ironer really pays for itself as any good home appliance should do to justify itself. When you consider the variety of ways it can be made useful, it is far from extravagant. For instance it helps you save money in your clothing investment, in your laundry bills, in pressing bills. It saves wear and strain on clothes, it presses suits, pleats skirts, can be used to press and shape sweaters, knitted wear. You can shrink yardage before doing sewing. You can do curtains yourself. And besides these there is the most important saving, that of your strength and energy, your health. In terms of such savings as these an ironer is not an extravagance but a real investment that pays."

5. **Fancy things**—"A very sensible question. I appreciate that this may seem like starting at the wrong end but it really works out this way for so many of my customers. Start out using it on the flat things that are easy to do. Even do more of them perhaps than you would ordinarily—such as towels you may not iron now. In this way you will develop skill and soon be trying more difficult pieces, and then you will find that even complicated ruffles and pleats are as easy for you as they are for our demonstrators. The ability to sit comfortably while doing the ironing will stimulate you to try more and more things and save standing on tired feet. You will enjoy the fact that the heat does not rise up into your face, that you will be cool and presentable in case anyone comes unexpectedly, instead of bedraggled and tired."

6. **Wants work done out**—"Can't blame you a bit for feeling so. But can you really send everything out to the laundry? There are always some things you prefer to do at home, special garments you would hate to lose or want to be sure are given the right care. And if you have a maid, how much easier to get and hold good help if you provide up-to-date equipment with which to work. Then too, should you be caught in an emergency, you could take care of the laundry yourself without the fear of being completely worn out in doing so. In the meantime you can really make the ironer pay for itself in several ways (enumerate from the list of advantages). Won't you just sit down and see how comfortably you can iron, etc.—"

ROCKY MOUNTAIN ELECTRICAL LEAGUE • PORTLAND GENERAL ELECTRIC CO.
CALIFORNIA OREGON POWER CO. • WASHINGTON WATER POWER CO.



Promotions and Stunts

Just as an electric kitchen is an excellent idea for the dealer who sells ranges, an electric home laundry in some part of the store, like that at the left, is an attraction to your store that can be made to draw many prospects. The one at the left is made by Westinghouse to be moved into a window or used at a fair or other exhibit.

- Night demonstrations of ironers and washers were found a good promotion stunt by a dealer who had a store near a neighborhood theatre. He was able to get husbands and wives together that way much more easily.
- A washer promotion used with success lately has been to clear the floor of all makes and models except one fairly well priced model, advertise a "buy," concentrate on selling the one model. In window and on the floor are stacked the machines, uncrated. When a sale is made one of the crates is tagged prominently. The idea quickens decision, prevents shopping around, dallying over details. The tag is used as an aid to asking for the order.
- A combination washer and ironer plan is a surprising sales builder. One successful dealer delivers an ironer with each washer sold to a customer of good credit. Often he then sells it on a single financing plan at very little added cost.
- Among good ironer stunts are: a free trial plan, an ironing party on a certain day with demonstrations and a regular school on home laundering, an ironer rental plan, a prize ironing contest among school girls at which parents are invited; various kinds of window demonstrations—by children, by a little pickaninny, by a man, by blindfolded or blind demonstrators; by a team of women, one doing ironing the old, hard way, the other on an ironer. A card demonstration in a window is always good, the cards on an easel telling the features—perhaps a salesman on the sidewalk to invite prospects in.

Your best Advertising

Besides the advertising of *product* that you do in co-operation with your manufacturer of washers and ironers there are other practical and inexpensive ways of advertising that are effective. Each manufacturer has available a variety of envelope stuffers, broadsides, posters and mats for use in newspapers or handbills. As a dealer you may wish to establish your own name more than that of the product occasionally. To do this, be sure to get your money's worth from your advertising expense by listing a service that you have to offer a customer. For instance:

Telephone directories are an important place in which to have a strong little ad. Even if you run only one line over your name, let it suggest a reason for buying, like this—"Clean clothing whenever needed or wanted, irrespective of laundry deliveries—for money saving, time saving, work saving electric washers and ironers see Yourname Electric Co., etc." The lists inside this Guide contain many short sales statements you can use.

Neighborhood papers, or classified sections of dailies make a good place to run small ads of this type.

When store demonstrations are to be held, advertise them. Send invitations to former customers by postcard. On the invitation use one of the sales points as a drawing card. It strengthens the appeal and will bring more people to the demonstration.

Door Openers . .

For cold canvass calls a door-opener is a big help. Many manufacturers offer little premiums such as the lingerie line shown below, together with the door-knob card offering it. The latter is placed on the door knob a day ahead of the call and prepares the way for it. Other inexpensive laundry premiums can be used in a similar way.

Every maker of washers and ironers makes available a big assortment of cards, posters, streamers, and other advertising aids, including window displays. Investigate these and select a few that you can use with profit. The idea to keep in mind is that whatever you select should be used for all it is worth to earn you back your investment

Floor and window cards (in sleeve form) that tell sales making advantages of ownership are more effective than just price tags

National campaigns are always worth tying-in to. Might as well bring the value of national advertising and promotion to a focus on your store. The manufacturers of washers and ironers have set Oct. 23 to 29, 1938, as "Washer and Ironer Week". The campaign will be played up under the slogan shown at the left—"for family washing, there's no place like home." Decalcomanias of this emblem can be had

ration. The winning designs have been released to certified manufacturers of IES Specification lamps. Samples were exhibited at the lamp shows in Chicago and New York last month.

●

STUBBS ELECTRIC CO., Portland, was winner of first prize in the Hotpoint national washer & ironer sales contest and fourth prize in the Hotpoint refrigerator contest.

●

C. M. TURNER, assistant to the vice-president of Ebasco Services, Inc., New York, and well known in the West was winner of a $500 award in the National water heater contest conducted by the Modern Kitchen Bureau. Turner graduated from the University of Washington, was a station operator for Puget Sound Power & Light Co. and served in Utah, Washington and Idaho as a member of the rate department of Electric Bond & Share Co.

●

"ELECTRIC RANGE SALES LETTERS," written by Edmund A. Schilling and published by Rollin Publishing Co., is a book containing 35 specimen letters designed to reach and sell every type of range prospect.

Sales Training for Merchandising Success

Practical schooling in sales, electric cooking and laundering is given Westinghouse dealers in southern California at the home equipment training center in the Westinghouse building, Los Angeles. Here is a typical dealer salesman class. Electric kitchen is at one end, laundry at the other; extra kitchen and laundry equipment along each side. C. H. "Ponzi" Kaufman, merchandise manager, is a great believer in sales training as an aid to attainment of better results

APPLIANCE SALES REPORT---JUNE 1938

A Summary of Dealer and Utility Reports Compiled by Associations, Societies, Bureaus, or Dealer Contact Departments of Utilities

REPORTING COMPANIES	Idaho Power Co.[1]		L. A. Bureau of P. & Lt.[2]		Montana Power Co.[3]		P. G. & E. Co.[4]		San Diego Cons. G. & E. Corp.[5]		San Joaquin Lt. & P. Corp.[6]		Southern Calif. Edison Co. Ltd.[7]		Utah Power & Lt. Co.[8]		Wash. Water Power Co.[9]	
	Current	6 Mos.	‡Current	‡5 Mos.	Current	6 Mos.	*Current	‡5 Mos.	Current	6 Mos.	Current	6 Mos.	Current	6 Mos.	‡Current	‡5 Mos.	Current	†5 Mos.
Ranges	354	1909	436	1948	103	531	399	1400	45	255	147	735	203	1562	315	1233	235	832
Water Heaters	279	1005	124	609	30	100	209	510	45	255	64	324	85	597	160	336	145	923
Air Heaters, aux.	5	174	7	442			84	2460	25	610	5	123	36	740	15	367	22	393
Air Heaters, 220			93	236			52	318			15	202						
Refrigerators	564	2431	3202	11611	837	3115	5710	16908	800	3750	668	3186	3493	17030	1321	3101	1115	2844
Dishwashers	3	10	8	63			13	59			3	37			3	19		3
Washers	253	1881	1715	7719	438	2416	2534	10944	325	1900	219	1570	1942	11582	867	3633	457	2030
Ironers	27	207	352	1455	31	252	388	1854	55	315	37	445	237	1583	43	216	29	156
Vacuum Cleaners	67	516	470	2454	216	1393	2177	9751	225	1320	48	541	722	4982	398	1998	205	920
Radios	238	3316	2363	12392	582	3646	6790	38980	800	5275	288	2583	2538	23120	925	5964	952	4956
Mixers	68	302	154	736			374	1471	125	760	45	244	189	1398	109	736	219	650
Cookers, Casseroles	24	94	51	342					85	430	54	253	71	388	63	376	580	1445
Irons	396	2091	505	2727					475	2600	295	1710	764	5472	1026	4227	677	3080
Waffle Irons	63	583	162	1018					175	950	51	443	228	1844	272	1405	167	848
Toasters	113	838							350	1875	107	738	352	2716	320	1871	355	1687
Table Stoves	339	830	109	860	627	4722			100	440	90	509	148	1355	496	2466	183	764
Heating Pads	19	266	50	727					60	670	16	225	71	1045	98	949	58	600
Curling Irons													24	227	151	928		
Coffee Makers	85	843	64	263					400	1840	99	645	254	1726	362	1908	350	1898
Sewing Machines	12	60	159	902			382	2648	95	515					218	806	87	314
Clocks	63	469	166	333					300	1750	99	854	349	2922	204	1144	239	1068
Fans	159	230									493	790	338	731	32	97	208	321
Floor Polishers			19	122														
Sun Lamps		47											18	158	3	51	9	31
Reflector Lamps	106	1183									249	828			610	3583	578	6588
Miscellaneous Lamps	110	1404			434	3498									793	3391		
Yard Lights			302	1304							61	280						
Misc. Small Appl.									500	3500	66	649	541	3605				

SOURCES

[1] Figures compiled by Electric Equipment Sales Association. Include power company sales of all reporting dealers—about 60%

[2] Compiled by Los Angeles Bureau of Power and Light for territory served by that system.

[3] Combined dealer and company sales from report of Montana Power Co.

† Does not include dealer figures for two divisions for January and February, 1938.

[4] P. G. & E. reports sales of major appliances only based on accurate reports from dealers' accounts. Ranges, water heaters and air heaters include company and dealer sales. *Due to delays in compiling report current and total figures are always one month behind those figures of companies reported in other columns of this table.

[5] Gathered by Bureau of Radio and Electric Appliances of San Diego County. Estimated monthly sales figures used in this table: Miscellaneous figures includes fans, curling irons and sun lamps.

[6] Includes dealer reports from Midland Counties Public Service Corporation also. Compiled by Valley Electrical Supply Company.

[7] Includes reports from dealers on San Joaqin Valley system of company as well as Southern California areas served.

[8] Includes Utah Power & Light Company territory in Utah, Idaho and Wyoming. Also Western Colorado Power Company territory.

[9] Dealer sales only for Spokane and company territory. Company sales not included. Table stoves, grills included with cookers.

‡ June figures were not available at time of going to press.

Tacoma Puts Downtown Distribution Underground

THE necessity for extensive rebuilding of the downtown distribution system in Tacoma, Wash., developed when the depression was in full swing. The unsightliness of the antiquated aerial system had been apparent for a long time, but after 35 years of service its need of replacement and repair was becoming urgent.

Accordingly, plans were drawn up for a 3-phase, 4-wire, 120-208-volt a.c. star underground to serve the business district. The City of Tacoma, Department of Public Utilities, Light Division, laid out the program and started construction in 1935.

The depression had a bearing on the manner of construction, and on the time of its initiation. Many customers were delinquent in their light bills. Hence the department decided to launch its underground program, allowing delinquent customers to work out their light bills by labor on the construction of ducts and vaults.

The new network replaces not only the old overhead, but also an underground system placed in service in 1926 to feed power and light separately, the first 3-phase at 480 volts, the latter single-phase, 3-wire at 120-240 volts.

The network is being served with four 4,160-2,400-volt, 3-phase, 4-wire star, 350,000 circ.mil feeders from the City's Nisqually Substation and four feeders of the same size from Steam Plant No. 1.

Two of the four main feeders to the network from Nisqually substation consist of three conductor 350,000-circ. mil. cables and the other two of three single-conductor 350,000-circ.mil cables. All have corona-resisting oil-base compound, 5,000-volt rubber insulation, unshielded and non-leaded. These cables are connected near the central part of the network area to 3-conductor, No. 4/0, paper insulated, lead-covered cables which extend the full length of Commerce Street. Three of the feeders from Steam Plant No. 1 are paper-insulated, lead-covered. The fourth is insulated with corona-resisting oil base compound rubber.

Branch feeders to the streets on both sides of Commerce Street consist of three single-conductor No. 1/0 while vault branches are of three single-conductor, No. 4's. Both sizes of cables are insulated with 5,000-volt corona-resisting oil-base compound rubber non-leaded. All primary cables are fireproofed with Niagrite and Asbestoment cement.

Rubber insulation was used in place of paper and lead to forestall trouble from electrolysis and the migration of oil down steep hills, to facilitate splicing, and to eliminate the need of expensive junction boxes and wiped joints.

On each feeder at the Nisqually substation are three single-phase 400-amp. 2,400-volt induction regulators, operating with 10-per cent resistance compensation and no reactance. This under-

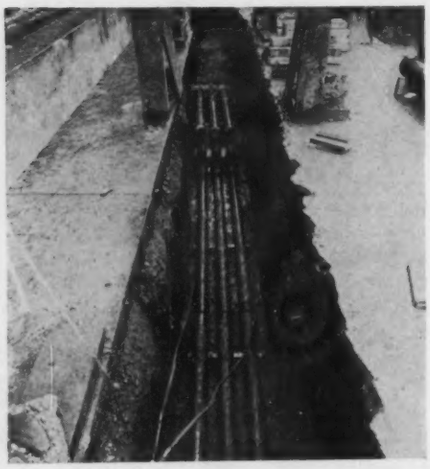


Fig. 1—Duct line construction showing buried neutral

compensation scheme so far is working out very satisfactorily without the regulators being interconnected. In the most remote sections, 118 volts is maintained under load and does not vary more than 3.5 to 4 volts throughout the day.

On new construction, network cables consist of two single conductor 250,000-circ.mil conductors per phase. They are insulated partly with 8/64 in. of mineral-base, 60 per cent rubber compound, with no tape and braid, and part with 6/64-in. mineral-base, 60-per cent rubber compound with tape and braid. Each set of cables is located in separate ducts.

Consideration was given to burning of the low-voltage insulation. It was found by tests that this insulation burned quite readily after it was ignited. However, by passing 1,840 amp. through the 250,000-circ.mil wire it took 4.5 min. to soften the insulation and 6 to 7 min. to melt it. The insulation did not ignite, although in 16 min. it fell off the cable, while the wire was red hot. Limiters were tested with 1,840 amp., and they blew after 1.5 to 1.6 min.

From these tests it appears that with current above 1,500 amp. the limiters will protect the cables in a suitable manner. The cables are being fireproofed to protect them from external fire.

The primary neutral on Commerce Street consists of one 750,000-circ.mil paper-insulated, lead-covered cable and on the other streets of two No. 2/0 weather proof wires. All are located in a separate duct from the feeder phase cables and are grounded at each manhole and vault.

The network neutral consists of two No. 4/0 weatherproof cables. One neutral cable is in each secondary-phase

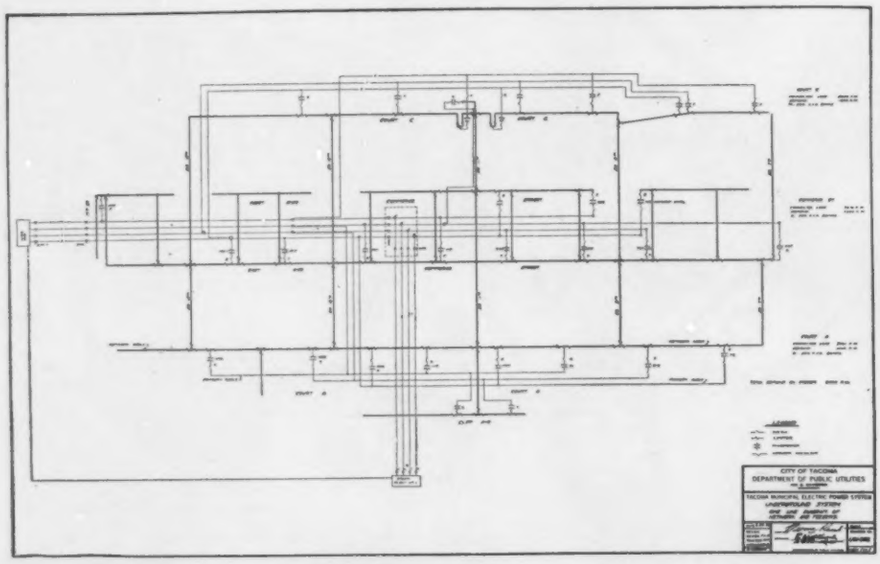


Fig. 2—One-line diagram of the new distribution

ENGINEERING

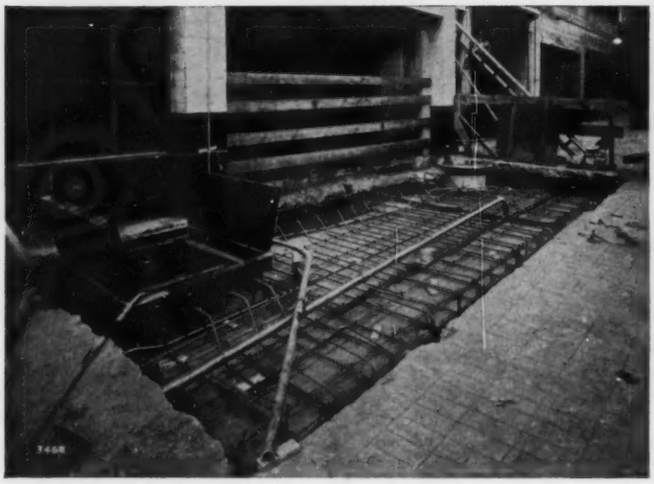


Fig. 3—Vault, showing steel reinforcement

Fig. 4 — Junction manhole, showing crab and limiter

cable duct in some cases and buried in the other. These neutrals are also connected to all vault and manhole grounds and primary neutral.

Splices on new primary feeders are made by wiping a split sleeve on the conductor, insulating with high-voltage compound-rubber tape and three or four layers of friction tape and applying a coat of P & B paint. Taps are made in the shape of tees thus eliminating crotch splices.

Bolted fittings are used on secondary cables for secondary services. In the case of through splices, tubular copper connectors and limiters are being used.

Compression type fusible connectors called "Limiters" are being installed in the network cables. Wherever power is entering the network, that is at vaults, Burndy moles and limiters are placed. At street junction manholes where the network cables from the various streets come together, crab joints and limiters are being installed.

Split, electro-bestos shells are used to cover the limiters. These shells contain an arcing chamber to confine the arc from the limiter.

The crabs are insulated with special rubber covers. All crab covers and limiter shells are being taped up and painted with P & B.

Equipment in all vaults consists of three 100-kw., 2,400-120-volt, 3.5-per cent reactance, outdoor-type transformers; one 1,200-amp. submersible network protector either G.E. or Westinghouse, latest type. Connecting the transformers to the protector are 800,000-circ.mil rubber-covered cables supported on cable-space racks. The protector is mounted in the same compartment with the transformers. In the secondary compartment of the vault are three Burndy moles, mounted on cable racks, and connected to the protector with two 500,000-circ.mil rubber-covered cables per phase. Network cables and services are connected to the moles.

Cutover from aerial to underground is now completed. This required the service to the customers to be interrupted long enough to disconnect the aerial and connect the new underground. On small services this amounted to 15 min. The cutover was made in the day time on week days. Large services were cut over on Sunday or at night, whichever was most convenient to the customer.

Two primary single-phase feeder faults have occurred on the network system. In both cases, the back-up fuses on the protectors were blown, and the protectors did not trip out.

This was thought to be due to the fact that the reverse current on the faulty phase was lagging the network voltage, reversed, at an angle close to 90 deg. and thus did not produce enough effective negative torque on the network meter disc to counteract the positive torque produced by the other two good phases.

On the above supposition, it was decided that the feeder O.C.B. relays at the substation were set at too slow a speed and for too high a current and should be speeded up, so that the feeder would be deenergized as quickly as possible. This would eliminate the positive torque on the relay disc and trip out the protector before the back-up fuses blow.

Accordingly, the relays were changed from 0.4 to 0.2 sec. and the current from 480 to 400 amp.

Costs are estimated as follows:

Commerce Street—Duct and vault system	$ 60,158.07
Electrical Equipment	180,939.19
New underground system—Ducts and vaults	171,948.62
Electrical Equipment	180,000.00
Total	$573,045.88
15 duct line	$7.25/ft.
12 duct line	$6.50-$7.00/ft.
9 duct line	$5.00/ft.
Vaults	$1000.00-$1400.00 each
Service Handhole Large	$200.00
Service Handhole Small	$75.00
Manhole Small	$280.00
Manhole Large	$625.00
Total cost per kw	$45.61

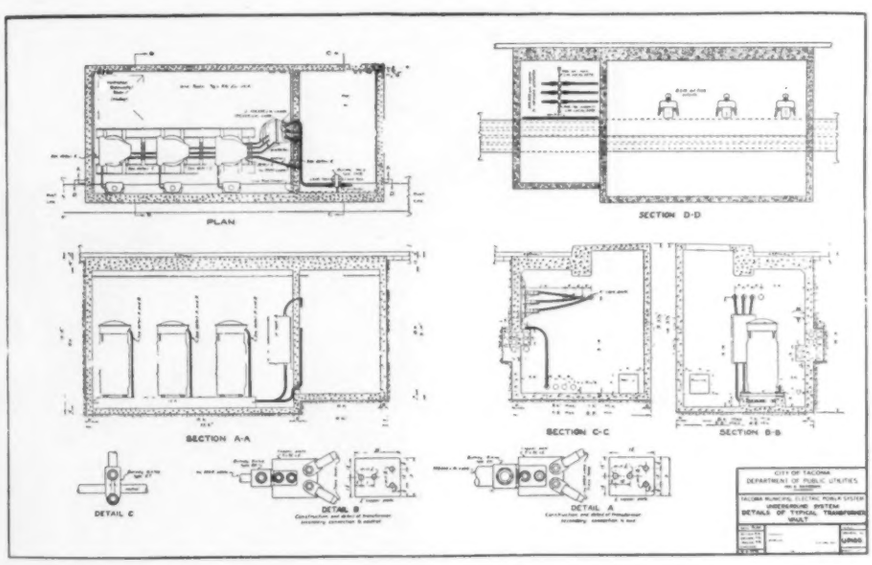


Fig. 5—Typical vault details

Field Machinery Aids in Building Skagit No. 2

Mass Production Methods Speed Construction of Double-Circuit Transmission Line Linking Skagit River Plants with Seattle's South Substation

By H. V. STRANDBERG
Transmission Engineer
Lighting Department, City of Seattle

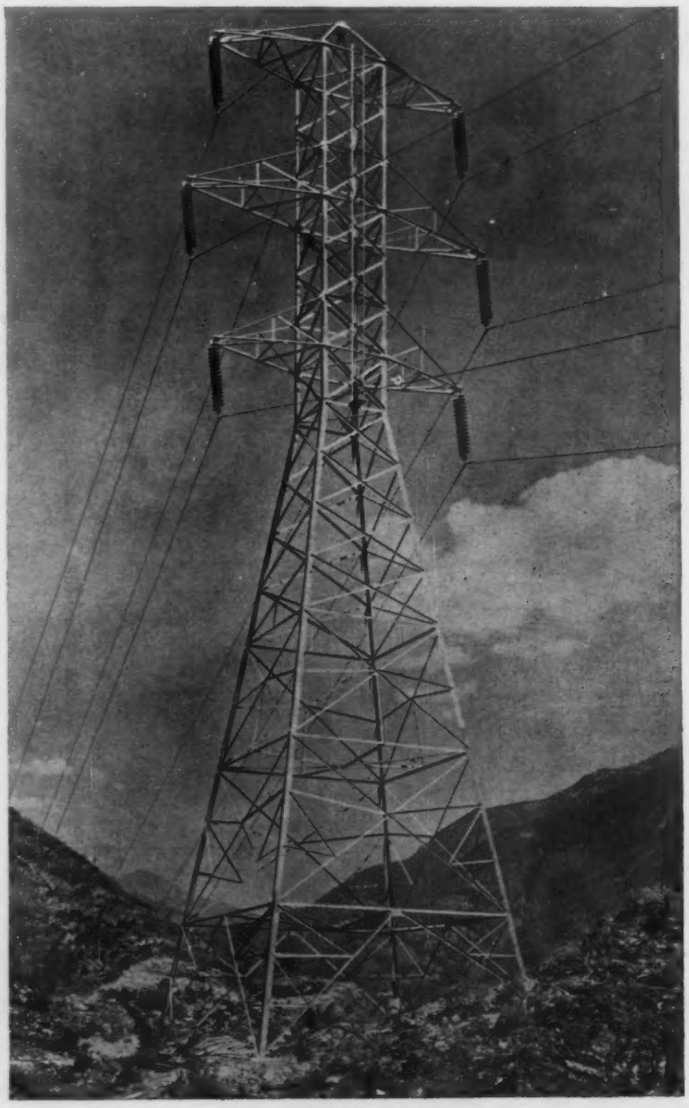
NOTEWORTHY for application of mass-production technique to transmission construction through the rough terrain characteristic of the Northwest is the City of Seattle's Skagit transmission line No. 2. It represents an important addition in a program begun in 1918 for development of upper Skagit River as a primary source of hydroelectric power.

To date, power generated at Skagit has been transmitted over a single-circuit, 165-kv., 100.5-mi., wood-pole, H-frame line, rated 90,000-kva., in service since 1924. Line No. 2 is scheduled for completion two months hence.

The first 5¾ mi. of this 121.8-mi. line were built by the Lighting Department in 1936, temporarily tying to the 165-kv. line to North substation. In May 1937, on a bid of $1,124,297, A. S. Schulman Electric Co. of Chicago was awarded the contract for building 406 foundations and 560 towers, which will be completed this month.

In April of this year, Fritz Ziebarth of Long Beach, Calif., received the conductor-stringing contract at $165,800. The stringing, begun May 31, will effect completion of the line in October.

Line No. 2 was designed as a unit in the transmission required for an ultimate 840,000-kw. machine capacity on the Skagit. Present capacity consists of 58,500 kw. in three units at Gorge, and 120,000 kw. in two units (half of ultimate) at Diablo. At the selected transmission voltage (240 kv.), six lines eventually will be needed—an arrangement which provides for flexibility in operation and economy in step-by-step development.



High cost of right of way, especially over farm lands, and of clearing, and the necessity for repeated brushing, were primary reasons for the choice of double circuit.

Heavy loading, ½-in. radial ice and an 8-lb. wind at zero deg. F., was assumed at line crossings, in accordance with requirements of State law.

Profile studies indicated that four types of towers would afford maximum economy, both minimum use of steel and the advantages of standardization being considered. These types are: A, light tangent; B, heavy tangent and light angle; C, heavy angle, and D, dead-end. Various arm combinations were used to maintain minimum electrical clearances to ground: 80 in. normal, 60 in. under wind. Arm lengths are: top and bottom 27 ft., middle 34 ft. Towers were designed to withstand 1½ times maximum calculated load under heavy loading conditions, and the design was checked by load tests on types A and B.

Double and triple insulator strings were used to keep working load under 5,000 lb. Tapered aluminum armor rods were used at all points of suspension.

The endeavor in foundation design was to make details lend themselves to mass-production methods and yet allow variations for exceptional conditions encountered in the field.

NEW TRANSMISSION

As these two articles on transmission record recent progress in the art, other long lines are being erected in the West and new refinements are appearing daily. Stone & Webster Engineering Corp. is putting the finishing touches to Southern California Edison Co.'s line to Boulder Dam. The Los Angeles Bureau of Power & Light is getting under way to build its third Boulder circuit. Several outstanding performance records have been recorded for speedy, efficient field work on the Edison line, and when reports of these become available, those representing new technique will appear in ELECTRICAL WEST.

Earth foundations are pad and column, and at all towers foundations were so designed that uplift resistance would exceed tower test loads.

Rock foundations for tower types A and B consist of anchor bolts grounded into holes drilled in solid rock; for types C and D, tower leg extensions concreted into holes blasted in the rock.

Table I summarizes line characteristics.

Along the first 6 mi., in Skagit canyon, many tower locations were extremely inaccessible, such being necessary to avoid the many avalanche courses along the canyon walls, and to keep ground clearances sufficient to allow snowslides to pass under.

Most of the line is through logged off lands. This fact necessitated extensive clearing of ground timber and danger trees, and brushing out—an operation that will have to be repeated every six to ten years.

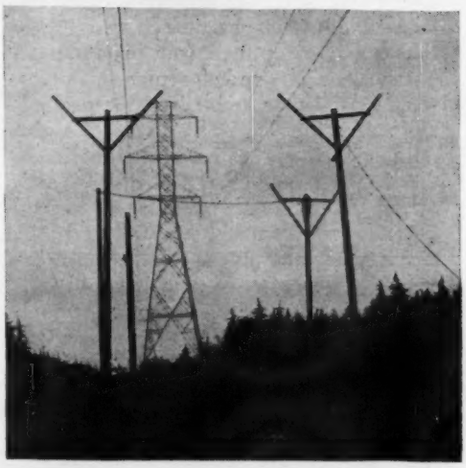
In clearing operations, a bulldozer was used effectively to remove stumps, clearing an area about 100 ft. square in which mechanical excavators could operate so as to deposit excavated material at a clear spot which was convenient for backfilling.

Considerable heavy grubbing was encountered in the logged-off regions. Proximity of the 165-kv. line and the dispatching telephone line, the latter but 37.5 ft. from tower centerline, made care in blasting stumps a necessity. Many stumps were 6 ft. in diam., and the fact these were removed with but little interruption on the telephone line and none on the power line attests to the skill of the powder crew.

Excavation of earth foundations, with but few exceptions, was accomplished with pull shovels. Two machines were used, one $\frac{5}{8}$-yd. and one $\frac{3}{4}$-yd. The latter, being much heavier, performed better where hardpan was encountered. The lighter machine was used most successfully in soft or swampy locations.

With these machines, it was possible to dig a very straight-sided hole not greatly exceeding the minimum size required for the proper installation of footings. Averaging 2.5 tower foundations per day, the two excavators were able to keep well ahead of concrete crews.

The soil encountered and footings used are given in Table II. Sixteen piling foundations were required, where peat was encountered and across Snohomish River valley, which is subject to annual floods. In one swampy location, where little lateral resistance was afforded by surrounding peat, the tower footings were tied together with reinforced concrete beams. Thus shear loads were transferred to a solid understrata through the cantilever action of pile clusters in each foundation.



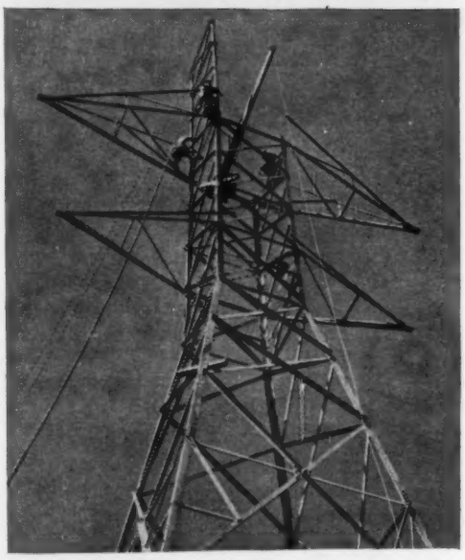


Fig. 1—(Opposite page) Type C tower, evident is the rough terrain with which construction crews had to contend

Fig. 2—(Top to bottom): (a) weight assembly, (b) highway guards, (c) tower erection in progress, (d) typical rock anchor

In about 90 per cent of the earth foundations it was necessary to shore only two sides of the excavation. This was done by a shoring and trimming crew which moved in immediately following excavation and prepared the site for the form crews. In soft ground, cribs were framed on the surface and immediately set in the excavations as they were completed. In extreme cases, vertical sheathing was driven behind timber sets by use of the excavator. Numerous self-priming gasoline-driven pumps were used for unwatering.

Forms for footing slabs were of wood. Metal forms were used for the transition section and columns for type Ea and Eb earth foundations (see Table III). The metal column forms consisted of half sections 3 ft. long, reinforced by angle iron and bolted together, six pieces making up a complete column 9 ft. long. The transition piece consisted of a portion of the top form of the slab and a short conical section developed to give the proper batter. One-foot column form sections were used to give the additional length to type Eb foundations.

Tower anchorage consisted of a galvanized steel stub embedded in the column and held in place by a cleverly devised jack which clamped the stub to the top of the column form at the proper batter. Excavation shoring was so placed as to provide support and anchorage for the concrete forms. Adequate bracing made it unnecessary to use templates to hold the stub angles in their proper relation, thus leaving the area between the foundations open for installation of wheelbarrow runways.

Concrete was mixed at the site in 7-cu. ft. trailer type mixers, equipped with automatic water gage and timer. One concrete crew and set-up crew using two mixers were able to pour three foundations per day. When heavy type C and D foundations were encountered, they were generally taken in stride, both mixers being used to complete the pour in one day.

Foundations were generally backfilled with a bulldozer, though in a few soft-earth locations a dragline scraper was used.

At 37 locations, skylines were required, many of the set-ups being more than 1,500 ft. long. These were powered by a gasoline logging donkey and handled both men and materials, in-

cluding such tools and equipment as air compressors and erection hoist. Schulman Electric used a lighter rig at 17 locations, and did not transport men or machinery.

The eighteen towers erected by the City in 1935 were in inaccessible locations of limited working area. Erection was piece-by-piece, using a floating gin pole and single-drum erection hoist.

On the remaining 560 towers, Schulman Electric employed five erection crews which averaged four towers every five days, including all types of structures and extensions. Each crew consisted of four top men, four groundmen, a truck driver and foreman. Towers were partially assembled on the ground and raised in sections by means of a gin pole supported in the crotch between the bracing and the tower legs and swung from corner to corner as required. By this method a 70-ft., type A tower, weighing 14,900 lb., could be erected in 5½ hr. after being laid out and partially assembled on the ground by two men in advance of the erection crew.

Long spans, river crossings and rocky terrain made it necessary for the city, in its work between Diablo and tower No. 18, to string under full tension.

A special tension machine was built for this purpose, consisting of two multiple-grooved cast-iron drums, to which brakes were applied through a linkage. Conductor from the reels was given five wraps around the pair of drums and with but slight braking on the reels could be paid out at a very uniform tension of about 8,000 lb. One conductor was pulled at a time, together with a ⅜-in. strawline, which was transferred at each tower into the proper position for the next conductor to be strung. This line was used to haul back the half-inch line used for pulling the conductor. By this method much hand labor over a practically impassable right of way was avoided. The same donkeys as for the skylines were used to string conductor. They had sufficient drum capacity to pull in more than 9,000 ft. of conductor at a time.

Stringing under the Ziebarth contract was started at tower No. 425 and is progressing toward South substation. Many road and distribution line crossings are found in this section, requiring installation of guard structures.

Three conductors are being strung at a time by use of caterpillar tractors equipped with drums to line the conductor across impassable sections of the right of way. Conductors are sagged in 9,000-ft. sections. Transits are used to measure the proper sag at approximate mile intervals.

The conductor was purchased in 1930 and stored at South substation. Deterioration of the reels has made it necessary to re-reel the conductor to permit field handling.

The Schulman Electric contract is part of a public works project involving construction of the first lift of Ruby Dam* and of South substation. In King County, 147 tower foundations were constructed under a work relief project, and 7 by the contractor in addition to his contract. Schulman representatives in Washington are: C. A. Wikle and H. L. Small, and Ziebarth: M. A. Pithoud. Glen Smith, superintendent of outside construction, under W. J. McKeen, acting superintendent, supervised the job.

Fig. 3—(Top to bottom): (a) clearing a tower site with bulldozer, (b) pull shovel in operation, (c) city tower erection hoist being transported by skyline, (d) reel stands, (e) jack for holding stub angles

Table I—Skagit Line No. 2

Length	121.8 mi.
Sending voltage	240,000
Receiving voltage	220,000
No. of circuits	2
Capacity per circuit	160,000 kw.
Conductor	
Size	795,000 circ. mil
Type	A.C.S.R.
No. of steel strands	19
No. of aluminum strands	30
Ultimate strength	38,000 lb.
Max. working tension	14,500 lb.
Normal tension	7,500 to 8,000 lb.
Max. span	3,308 ft.
Min. span	395 ft.
Normal span	1,200 ft.
Towers	
No. of towers	578
Type	Double-circuit, galv. steel
Vertical spacing	17 ft. and 18 ft. 6 in.
Middle conductor offset	3 ft. 6 in. out
Spacing between circuits	27 ft.
Min. ground clearance	30 ft.
Overall tower height	109 ft. 8 in.
Insulators	
Standard suspension	14 units
Strain positions	16 units
M & E rating	15,000 lb.
Size, diam.	10 in.
Spacing	5 ¾ in.

Table II—Soil and Footings

Soil	No. of Towers	Foundation
Peat	2	Special
Clay	111	Stand. and Special
Sand, Gravel	228	Standard earth
Hardpan	165	" "
Broken rock	27	" "
Solid Rock	45	Stand. rock and Special

Table III—Foundations

Standard	Machine Excavation (cu. yd.)	Reinforcing Steel (lb.)	Concrete (cu. yd.)
Ea	120	1,776	9.6
Eb	228	2,324	20
Ec	314	2,923	36
Ed	510	4,046	74

* Electrical West, June, 1938, page 58.

Single Circuit Serves Aqueduct Plants

Synchronous Motors Constitute Almost Entire Load on Metropolitan Water District's Line from Boulder. Ability of Water System to Deliver Despite Power Outages Makes Economies in Transmission Design Practicable

CONSTRUCTING 237 miles of transmission line to carry Boulder Dam power to synchronous motors concentrated in five pumping plants along the Colorado River Aqueduct was the job that confronted Metropolitan Water District of Southern California. As initial installations at these plants near completion, the District's new transmission line stands ready for service, capable of operating with more than 50 per cent of the ultimate 310,000-kw. load.

Outages at three of the pumping plants will cause no loss of water. At the other two, reservoir capacity will accommodate a 40-min. input and require spilling of water thereafter. But large water storage in the terminal reservoir will assure continuous water distribution despite a power interruption. Pumps and aqueduct are so designed that 93.5 per cent operating time, at ultimate development, will utilize the allotted 1,500 sec.-ft. of Colorado River water.

Because of the nature of this load, the District's first transmission line has been built to give nearly continuous service and yet capitalize on single-circuit economies by reason of the fact 100-per-cent service is not an essential. Hence ground wires and buried counterpoise are not used except adjacent to pumping plants, although towers are designed to permit addition of overhead ground wire brackets should operation indicate their advisability.

The line is single-circuit, 3-phase, 230-kv. It leaves Boulder running southwest through 3 mi. of rugged country, thence south 81 mi. to Camino switching station. There it branches. One line extends 60 mi. southeast to Gene pumping plant, the other 49 mi. south-southwest to Iron Mountain plant, thence 30 mi. southwest to Eagle Mountain plant, and on 14 mi. to Hayfield plant, last lift on the aqueduct. Intake plant is energized from Gene over 2.2 mi. of double-circuit 69-kv. line.

Latest cost estimates place the total at less than $2,440,000. Figured solely on 237 mi. of 230 kv., this amounts to $10,300 per mi.

In field preparation, a high-accuracy profile proved invaluable in checking and avoiding errors. Preliminary work was such that material could be ordered to fill actual conditions. Locations were made to permit use of either copper or aluminum conductor, separate locations being required in only one instance.

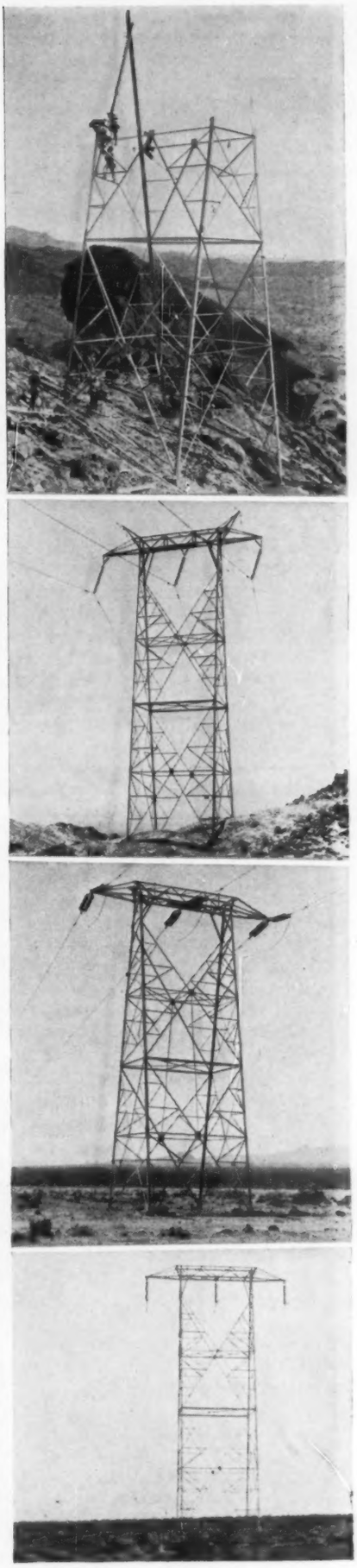
Major contracts for materials and construction were as follows:

Newberry Electric Corp., telephone line	$ 71,000
Bennett & Taylor, patrol roads	75,000
Fritz Ziebarth, line construction	449,000
Pacific Coast Steel Corp., steel towers	431,000
Aluminum Co. of America, Alum. conductor	627,000
Anaconda Wire & Cable Co., copper conductor	43,000
Graybar Electric Co., Ltd., suspension insulators	92,000

In all, some 60 mi. of footing holes were excavated by means of a Barber-Greene excavator, mounted on a crawler. Hand labor had to be resorted to in most all other cases.

In most cases, concrete footings were composed of a steel stub angle attached to a grillage of structural members, the whole being incased in concrete. Footing steel was assembled at the site and reinforcement steel wired in place. Reinforcement for the concrete envelope is provided by vertical bars spaced around the stub angle, by anchor bolts in the angle, and by a ¼-in. spiral around the top 3 ft. of footing.

These concrete anchors, although for standard towers only 12 in. in diam. and enclosing a 4x4x5/16-in. angle, have so far (over 2 years on many footings) shown no signs of the customary cracks which usually radiate out from the corners of the angle to the edge of the concrete. This is largely due to the ¼-in. spiral, on 3-in. spacing, which was carefully kept close to the top of the concrete. It is also due to the fact that temporary dead-ending of conduc-



(Top to bottom): (a) erection of a dead-end tower on the 69-kv. line connecting Gene and Intake pumping plants, (b) angle suspension tower on copper section of line, being within a mile of the switch rack it carries the ½-in. ground wires, (c) dead-end tower; in the 237 mi. only 12 angles were sufficient to require dead-ending (d) standard tower weighing 10,200 lb., used on tangents with spans up to 1,710 ft., and at 1-deg. 30-min. angles on normal spans

tors to footings was never permitted.

Where the line crosses the alkaline bed of Danby Dry Lake, pile footings were employed. Each consists of 3 piles, driven to 20 ft. in small pilot holes. About 1 ft. below ground, a 1-in. layer of asphaltic mastic was placed around the piles. A base layer of concrete was then poured 1 to 2 ft. thick, then a ½-in. layer of mastic, topped by the reinforced concrete cap, 2 ft. 4 in. thick. Imbedded in the concrete cap were hooks bolted to the piles and a short footing stub and grillage.

In all cases tower legs lapped and were bolted to the stub angles.

The line consists of 940 towers of five types, as follows:

S.	Standard suspension	736
A.	Angle suspension and heavy loading suspension	87
D.	Dead end	37
H.	Special suspension for wide conductor spacing	68
R.	Special heavy suspension for railroad and major telephone line crossings	12

A light, 27-ft. spar gin pole was used to erect tower legs. This was lashed to the lower leg and transferred from corner to corner. For speed, a line attached to a truck was used for lifting heavy members. Crews generally erected 2½ towers per day under good conditions, and while the contractor was trying out a bonus arrangement 3-tower days were numerous.

Normal suspension strings consist of thirteen 10-in. cap-and-pin Thomas insulators, dead ends of 15 units. Near the dry lake, tests showed wet flashover voltage to be lowered 30 per cent by alkali deposited from the atmosphere. Accordingly (with H-type towers), 17 units in suspension, 19 on dead ends, were used over the lake proper, 15 and 17 units respectively for several miles on each side.

Aluminum conductor was used except for a 10-mi. section across the dry lake. It consists of 795,000 circ. mil of aluminum in 26 strands surrounding a 7-strand, galvanized-steel core. Outside diameter is 1.108 in., weight 1.093 lb. per ft., break strength 31,000 lb.

In stringing, the aluminum was prestretched to 12,500 lb. for 5 min., then slacked to normal 7,500 lb. In the heavy loading section, design was for 12,000-lb. max. tension under ½-in. ice, 6-lb. wind and zero deg. F. Elsewhere: 9,360 lb., under no ice, 8-lb. wind and 25 deg. F. Should heavy loading be placed on a light-load section, tension would rise to 14,600 lb., but 50 per cent of ultimate. However, no ice is on record in such areas.

Aluminum conductor was shipped on reels containing 3,960 ft. These were "spotted" by the contractor along the right-of-way directly from the railhead in most cases. Prior to paying out cable the reels were placed in dollies and correctly spotted, then the three conductors were pulled out at one time by means of short lead lines from the ends of the conductor to a running board attached to the winch line of a 60-hp. caterpillar tractor.

Three reel lengths, 2¼ mi. usually was the length of pull when tensioning. Three "saggers" with transits mounted on special clamps attached to the towers were used in the sagging operations, head-set portable telephones being employed wherever possible in preference to arm signaling. Cable hanging in the sheaves furnished half the circuit and a ground to the tower the other.

Although grounds generally existed on both sides of the telephones being used, satisfactory communication was generally obtained where no ground existed between telephones. Conductors were spliced and compression dead-end clamps made up by means of the standard 100-ton hydraulic press and splicing sleeves and clamps furnished by the Aluminum Co. of America. Standard tapered armor rods, 10 per set, 114 in. long, and 0.466 in. in center diameter, were used at the point of attachment of all suspension clamps. Stockbridge-type vibration dampers were installed near the ends of all spans. Vibration has so nearly been eliminated by these dampers that no spans have yet been discovered where additional dampers are required.

The copper conductor used on 10 mi. of the line was furnished by Anaconda Wire and Cable Co. It is known as the twisted I-beam hollow copper cable and is made up of a twisted copper I-beam surrounded by two layers (opposite lays) of copper strands laid outside of the core. The core has a cross-sectional area of 44,300 circ. mils. The 50 strands, each 0.0966-in. diameter, aggregate 466,600 circ. mils, making a total of 510,900. Outside diameter is 1.004 in. and the weight 1.610 lb. per ft. Breaking strength: 22,500 lb.

Since the aluminum cable continues to stretch for a long period even though prestretched to its design maximum tension, the cable was sagged about 1.5 ft. above profile position in normal spans. Observations made on some of the first spans strung indicate that in a period of nearly 18 months the cable has dropped about 2 ft. from its original position. One foot of this drop occurred in the first 20 to 25 days, another half foot occurred the next 3 months, and the last half foot in the next 8 or 9 months. There has been no appreciable drop in the last 6 months. With this drop, the cable is now slightly below profile position but the clearance is still some 2.5 feet greater than legal requirements.

Construction of the line went forward smoothly, the contractor, Fritz Ziebarth, completing all work possible under his contract at the time, five months ahead of schedule. General manager and chief engineer for the District is F. E. Weymouth, and J. M. Gaylord is chief electrical engineer. Supervising surveys and construction on the transmission line was Robert N. Allen, while C. S. Glazbrook directed the design of towers.

Not Plotted

First of all there's a letter from Corbett McLean of Northwestern Electric Co. taking exception to the title, "P. G. & E. Puts in West's First High-Voltage Oil Cable", which appeared in the July ELECTRICAL WEST. As he points out, Northwestern's submarine cable, installed in 1932 across Columbia River, is oil-filled. Furthermore, it is rated 115 kv. Perhaps the fact it is operating at 66 kv. led an over-enthusiastic headline writer astray. In any event, the author, Mr. Koontz, was not responsible. The letter concludes: "P. G. & E. should be commended on the engineering required for problems involved in (its) installation. . . ."

A most unnatural state of affairs is being publicized by Westinghouse. It seems there's a dam (actually flood gates) across one Turtle Creek. Beside the creek is what ought to be a powerhouse but isn't. It's a pumping plant, and it pumps water "downstream" so that the "lower" side of the floodgates is the side on which the water's highest. Alleged to be an explanation is the fact that the Monongahela River, when high, has a habit of backing up into Turtle Creek. The floodgates and three 5,000-hp. pumps keep the creek flowing in the right direction, thus preventing floods.

The fact that a family of robins established residence atop a customer's electric meter in Seattle is noteworthy not so much for the incident itself as for the opportunity it gave a *Post-Intelligencer* writer. He wrote: "'Ohm Sweet Ohm' is the theme song of Mr. and Mrs. Cock Robin. With a shocking disregard for privacy, they built their home atop a light meter. But Mrs. Robin knows watts watt." He neglected to mention Mrs. Robins' frequent caution to the daughters in her powerhouse: "Nice little girls don't go ampere at strange men. How revolting."

A national advertising magazine speculates as to whether the FCC is going to attempt to regulate several hundred thousand new broadcasting stations, which, it suggests, Philco's remote-tuning device (which is wireless) for home radios might prove to be.

Recorder Helps Meet Water Heater Complaints

A RECORDING water meter developed in the Willamette Valley Division of the Portland General Electric Co., Salem, Ore., has proven of value in straightening out complaints of customers using water heating service on the 8-mill off-peak rate. Used chiefly on high bill complaints and complaints of insufficient hot water, this device has been successful in convincing the customer that the electric bill is, in fact, a measure of the amount of water heated in the tank. The average customer was inclined to believe that his trouble came from inefficient electric heaters and not from his use of water, and the demonstration made possible by the recording water meter was many times more effective than any verbal explanation could be.

An indicating water meter was tried first, but this device was not satisfactory since it did not show when the customer used large quantities of water nor how much water he was drawing during the "off-period," which is from 4 to 8 p.m. daily. The recording water meter shows the amount of hot water used during any 15-min. period during the time of the test, and, taken in conjunction with readings of the electric meter at the beginning and end of the test, proves that the electric bill rendered is an indication of the amount of water heated, and indicates further whether the tank and heaters are of sufficient capacity to meet the customer's demands.

The recording water meter is constructed as follows. A standard G. E. printometer and printometer clock are mounted on a board which can be hung on the wall or set on the floor. A standard Neptune water meter is used. The glass cover over the meter is removed, and a type D-13 contact device for types D-6 or D-7 watt-hour meters is attached to the case of the water meter, in such a manner that the shaft on the contact device is directly above and in line with the one foot hand on the water meter. The shaft on the contact device is extended through its lower bearing, and attached to the shaft is an arm bent so that the one-foot hand of the meter will push it around. A terminal board is provided on the side of the water meter; two cover studs are fastened to the side; and a glass cover put over the assembly. Electrical connections are made between the contact device, the clock, and the printometer, and an extension cord provided to supply power to the equipment. A weatherproof socket with a 15-amp. fuse is cut into one wire of the extension cord. When the assembly is set up and ready for use, a ground wire is connected between the water meter and a water pipe.

Water connections are made as follows. A ½ x 6-in. nipple is joined to each side of the water meter with a union. A 10-ft. length of ¾-in. rubber hose clamped to a ½-in. x 6-in. nipple. water meter, with the other end of each hose clamped to a ½-in. x 6-in. nipple. A half union is made up on each end of these nipples. Two complete unions are carried with the assembly in addition to the fittings made up on the hose.

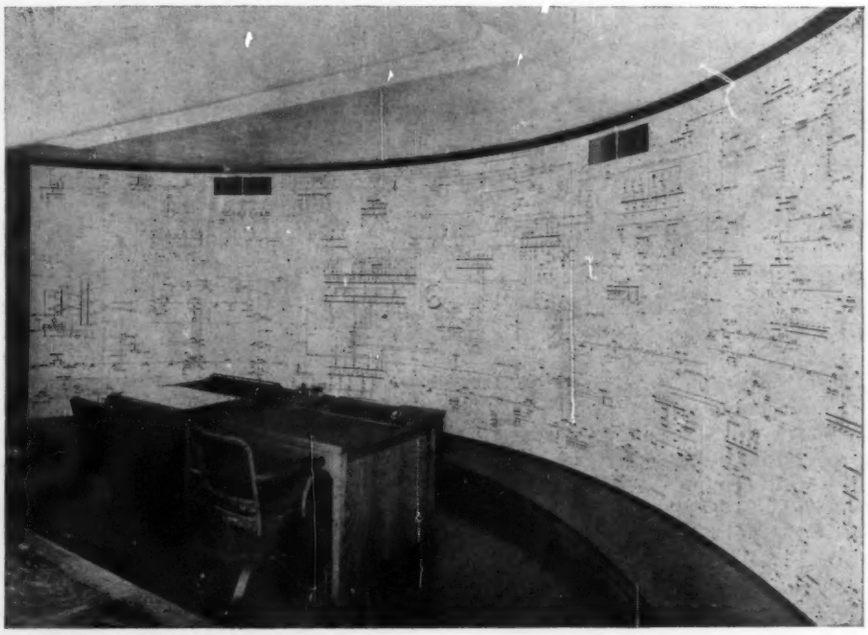
The installation of the assembly requires about 1½ hours. The cold water supply to the tank is broken at a union. The hose connections are made up to the broken union, care being taken to attach the "in" and "out" water meter connections to the proper pipe connections. In cases where the union in the cold water line will not make up with the union on the hose, one of the spare unions is installed to make a connection. The water supply must be shut off about 10 min. to make the meter connections. The electrical supply is obtained by cutting in the extension cord on any 120-volt source that is available, being careful to tap a circuit that is hot at all times. The assembly is left on a test from one to two weeks.

Before putting the assembly into service, it was found necessary to run water through the hose for a few days in order to eliminate any taste in the water from the rubber hose.

The contact device on the water meter makes 24 contacts per revolution. Each contact at the water meter causes the printometer to turn up one number. The clock makes a contact each 15 minutes and each clock contact causes the printometer to print a number on the printometer tape. The difference in the numbers printed by adjacent prints on the tape is the number of contacts made by the contact device on the water meter during a 15-min. period. In addition to the number turned upon the printometer, the hour is also printed so that the time of day can always be learned by an inspection of the tape.

Each revolution of the one-foot hand on the water meter causes the printometer reading to increase by 24. Therefore a difference of one in the printometer readings indicates that 1/24 of a cu. ft. of water has been used. This amounts to 1/24 of 7.48 gal. or 0.31 gal.

WASHINGTON WATER POWER CO. this summer put into service its new system dispatching board, located on the top floor of the company's Spokane office. Measuring 26 x 8 ft., and shaped in an arc, it was designed for readability and quick reference. It is black (and color) on white, indirectly illuminated. The system was painted on the board by stenciling through Scotch tape over a pencil diagram. S. M. Skadan is chief load dispatcher



For Dairy Sterilizing, A New Electric Steam Accumulator

By V. A. BLOXHAM & LYLE W. SMITH
Southern California Edison Company
Visalia, California

DURING the fifteen years or more in which electrical service has been generally available to California farming communities, many attempts have been made to adapt electricity to the job of sterilizing milk-handling equipment. This would seem to be a comparatively simple problem. However, of the dozens of devices which have been designed and hundreds which have been purchased none has fulfilled all the requirements necessary for their continued use or general acceptance.

No one has ever seriously doubted that electricity was the proper source of heat for the sterilization of utensils and containers for farm dairies. If the proper type of electrical device for doing this job had been available, its acceptance would have been as universal as the clean and trouble-free electric range in the home kitchen.

The San Joaquin Valley Division of the Southern California Edison Co. is located in the heart of the valley's dairy section. Over the past few years so many inquiries were received by our agricultural field-men from dairy operators relative to better sterilizing methods that it was decided seriously to investigate the problem. The Edison company's San Joaquin Valley new business department set itself to this task, believing that a service could be rendered to the dairy industry and a profitable load added to the company's rural lines.

Full-Grown and Useful

As a result, the electric steam accumulator has been engineered and developed to its present state—that of a full-fledged manufactured package article which, it is believed, fulfills all the requirements of application and use.

In the study of the problems surrounding the development of this device, field surveys showed that in the hundreds of dairies on the Edison company's valley system the producing of steam for sterilizing was accomplished approximately as follows: 10%—no steam used; 80%—primitive methods used; 9%—improved methods used, and 1%—electricity used.

Of the 10 per cent who used no steam, most of them had some method of heating water for washing utensils (mostly wood fires). Eighty-four per cent of those using production methods classified as primitive are using crude oil to heat a pipe coil into which water is fed. The other 16 per cent use wood.

The 9 per cent having improved methods of producing steam use oil, butane, kerosene, gasoline or natural gas for firing boilers of one description or another. Obviously the coil arrangement generally used is inefficient, extremely dirty, constitutes an ever present fire hazard, requires constant repairing and, more than all, does a very poor job of sterilizing.

State and local requirements for cleanliness and sterilization have constantly grown more rigid. Inspectors are insisting that improved sterilizing devices be substituted for the crude ineffective arrangements now in general use. The dairymen themselves are ready to accept electrical sterilizers, provided some of the undesirable features of former designs can be eliminated.

The conventional design of electric dairy sterilizer provides for vaporizing the small amount of water needed for the sterilizing job as quickly as possible at the time it is required. This method would seem to be logical. Their lack of success, however, lies in limitations affecting both the serving utility and the user of the device, and may be classified as follows:

Utility objections — 1. Additional transformer and service facilities required. 2. High peak load. 3. Poor load factor. 4. Operating cost too high to attract load. 5. Subject to frequent breakdown. User objections—1. High operating cost. 2. Steam available only during sterilizing period. 3. Must wait while heating up. 4. Pressure and volume not under control. 5. Operation manually controlled.

In order to overcome these limitations it was necessary to discard the conventional method and approach the problem from another angle. For the utility the most desirable qualification is high load factor, and for the dairyman low operating cost. Fundamentally the economics of these two factors are inseparable. The answer was a device having small electrical capacity and long operating hours. It was found that by storing heat in water over a 20-hr. period the average dairy sterilizing job could be done with 1,000 to 1,500 watts of electrical heating capacity.

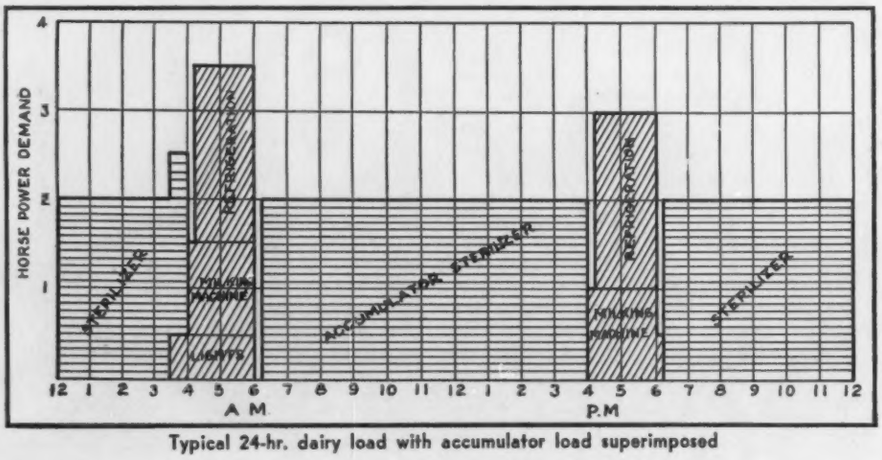
A New Competitor

Loads in the order of 1 to 2 kw. can be added to almost any existing rural distribution transformer serving domestic or miscellaneous loads, thus increasing the revenue without increased investment on the part of the utility. The resultant kilowatt-hour cost brings electricity within the field of competition with other types of fuels.

The electric steam accumulator consists of an ASME code boiler, internally fired by an immersed bayonet-type electric heating element controlled by a pressure switch and insulated for continuous high temperature. Two sizes that will fit practically all applications are being manufactured. Specifications are as follows:

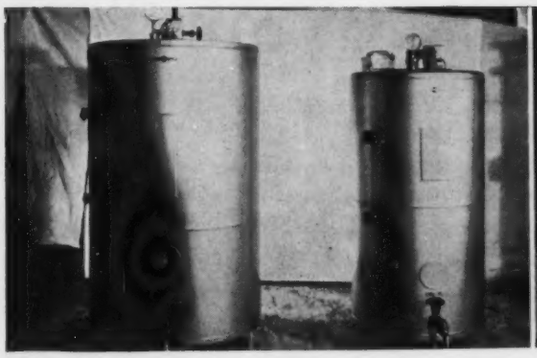
	Size 2	Size 3
Wattage	1,500	1,000
Effective water capacity-gal.	75	34
Max. 24-hr. B.t.u. input	123,000	82,000
Max. operating pressure—lb. per sq. in.	100	100
Height (floor to top of jacket)—in.	58	55
Diameter (jacket)—in.	34	26

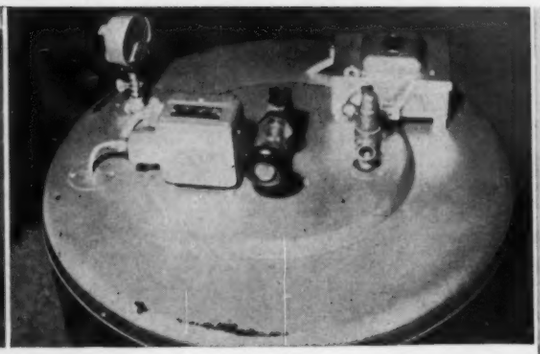
Much stress has been laid on the necessity for keeping radiation losses

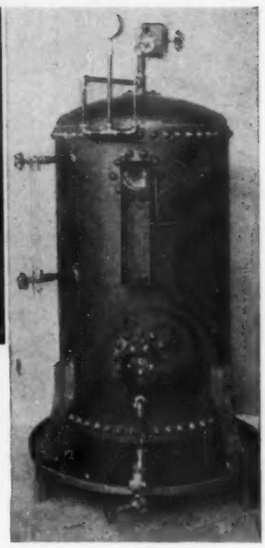


Typical 24-hr. dairy load with accumulator load superimposed

RURAL LOADBUILDING







Left: Sizes 2 and 3 accumulators. Center: Control and safety devices atop accumulator. Right: Rugged boiler

low and every precaution has been taken to keep the jacket temperature as near atmospheric temperature as possible. All openings have been trapped wherever possible so that losses at exposed fittings will be eliminated. The controls consist of an enclosed fused switch which serves as an electrical terminal box. Automatic operation is maintained by a pressure switch acting directly on the heater circuit. A safety pop valve protects the unit from over-pressure. The addition of a steam gage and water glass for visually determining the operating conditions completes the accessories furnished with the unit. Steam is drawn from the top of the unit and water is fed at the bottom through a hand-operated valve. The bottom outlet is also provided with a sediment blow-down arrangement.

In the dairy, sterilizing is done twice daily, 365 days a year. Heat is stored in the water gradually through a nine- to eleven-hour operating period by the small wattage heating element, during which time the boiler accumulates pressure up to a value predetermined by the setting of the pressure control switch. When steam is required for sterilizing, the steam valve is opened, thereby lowering the internal pressure. Lowering of the pressure immediately causes the heat (328 deg. F. at 100 lb.) already stored in the water to dissipate itself by boiling off the water. Two to four gallons of water are thus vaporized at each sterilizing period. After all the steam requirements are taken and the pressure reduced, an amount of water is added equal to the amount vaporized, and another nine- to eleven-hour accumulation of heat is begun.

An Ideal Load

No provision is made for removing hot water from the unit, simply because water above 212 deg. F. cannot be successfully drawn off. Furthermore, any such water removal would tend to defeat the heat storage principle of operation. Wash-water is heated by injecting live steam into it.

The water volume and the electrical capacity of the heating element in the accumulator have been so proportioned that the heating period on the average dairy would be completed only a short time in advance of the sterilizing operation. This period is also determined by individual requirement and pressure control switch setting. The block graph illustrates a 1,500-watt accumulator type sterilizer imposed upon a typical 24-hr. load curve of a typical Grade "A" dairy in the San Joaquin Valley. There is little question that from a utility point of view this is an ideal load, with its continuous operation staggered with the periodic operation of other dairy equipment. Furthermore, it is single phase and non-inductive. Elements are designed for either 110- or 220-volt operation.

From a group of test units in actual operation, a part of which has been installed nearly one year, the following average operating values have been computed:

	Watts Connected Load	Annual Kw.-hr. Consumption	% Annual Load Factor	Annual Kw.-hr. per Hp. conn.
No. 2 Size	1,500	10,500	80	5,250
No. 3 Size	1,000	6,900	79	5,150

The success of any device in final analysis depends upon its cost and value to the user. The electric steam accumulator is a device designed, first, upon the requirements of the dairy farmer. One of the first principles of dairy operation is cleanliness. It can hardly be said that the heavy smudge from oil and wood fires and the attendant products of combustion of base fuels promote cleanliness. The neat appearance of the unit with complete freedom from any kind of dirt, together with pride of possession, definitely promotes cleanliness throughout the dairy.

The fact that no waiting or work is required when ready to sterilize appeals to the dairyman. High pressure steam is instantly available at the turn of a valve. The average sterilizer box with its contents can be raised to 200 deg. F. in five to ten minutes and plenty of live steam is still available for heating water or the use of the steam hose on stationary equipment.

Operation is entirely automatic except the refilling of the boiler through a valve in the water line. The fire hazard existing wherever liquid volatile fuel is used is, of course, entirely eliminated. The construction of the accumulator is such that it is practically impossible for it ever to constitute a safety hazard, even through extended years of use. Installation is extremely simple, requiring only that it be set in place and a ½-in. pipe be connected from the cold water line, a ½-in. pipe to carry steam and a pair of wires into the electrical terminal box.

Electricity Equals Oil

On existing agricultural rate schedules the sterilizing unit may be operated at a cost that, in most cases, will not exceed the cost of oil for doing an inferior job. Seven to nine dollars per month, which represents the average oil bill, will supply electricity to do the entire dairy sterilizing job.

Although our purpose was to develop equipment for dairy sterilizing, the steam accumulator is adaptable to any job requiring a comparatively small amount of high pressure steam. Clothes cleaning and pressing, dish sterilizing in restaurants, and automobile steam cleaning are only a few of the jobs that present themselves as potential markets.

It must be borne in mind that the accumulator unit is not merely a glorified water heater. Few of the problems involved are similar. It is, in fact, a full-fledged high-pressure boiler modified to eliminate the operation attendance, increase the safety and reduce the maintenance customary with other types of boilers. The only maintenance anticipated, once the unit is installed properly and adjusted to the job at hand, is in descaling the heating element. The interval between cleanings is determined entirely by the hardness of the water. Accumulators now in operation in the San Joaquin Valley indicate that one cleaning every two years will be sufficient.

EDITORIAL

Our Accurate Snow Surveys

NO better proof of the effective technique which has been developed for predicting watershed runoff by means of snow surveys is needed than an account of the experience this year in the Lake Tahoe watershed. In April the final prediction was issued that the lake waters would reach a maximum elevation of 6228.80 feet. Late in July the actual maximum elevation was 6228.85 feet. The prediction based on the surveys conducted during the winter by an intrepid group of snowshoers and skiiers was within five one-hundredths of a foot of the actual conditions!

When Prof. J. E. Church of the University of Nevada first proposed that power companies, farmers, irrigation districts and the state band together for the purpose of conducting these snow surveys, few people realized the interest this program would generate, the degree of perfection which would be reached or the benefits that would accrue. Today it is not only possible to predict accurately the amount of water a given watershed will produce for power generation and irrigation, but also to determine whether or not serious flood conditions might develop. The technique has been applied generally in all sections of the West where water is a factor in power production and irrigation. Furthermore, there has been set up an international league which exchanges experiences and fosters the further development of the snow survey program.

The West has reason to be proud of Professor Church and proud of the group of stalwarts who conduct these useful surveys.

Put Your House in Order

WITH the temper of the public as it is today, every business—large and small—has a public relations problem whether it knows it or not. In the electrical industry the common assumption is that the utilities alone are "on the spot." This is fallacious. The whole system of American enterprise and initiative is under indictment. And that makes every business a party to the cause.

If many businesses are apathetic toward the problem it is simply because they do not understand it. Their thinking is confused and vague. They forget that the public whose goodwill they must constantly woo is made up of three parts and three only. It consists of their employees, their customers and prospects and their community.

Fundamentally there can be no satisfactory public relations without satisfactory relations between a business and its employees. Until all legitimate cause for complaint by labor has been eliminated, there is nothing which can be done to improve public relations. Assurance of the health, safety, comfort, earning power, security of employment and education of employees is the initial step. Education of employees on the facts relating to the business—policies, progress, products, practices, personnel, plans—will prevent misunderstandings, promote harmonious, enthusiastic support. Certainly unless the employees of a company are sold on it, the rest of the public will be mortally suspicious of its integrity and sincerity.

Similarly the customers and prospects of a business today demand something more than a good product and a reasonable price. They expect courteous treatment. They demand knowledge about the company itself, its policies and practices. They want to know how it treats its people. They expect compliance with certain reasonable social and economic dictates. Unless they receive these assurances, they will buy elsewhere.

Finally, the community in which a business is located demands that the business be a good citizen. This means that it accept its full share of community responsibilities. For unless the people of the community in which it operates—the housewives, the merchants, the teachers, the press, the preachers and all the rest—understand and appreciate the fairness and integrity of a concern, that concern can expect little in the way of cooperation in solving its problems.

Beyond these three groups no company has any public relations problem. But unless it recognizes all three and puts and keeps its house in order with all of them, it cannot expect to win and retain goodwill.

A Salesman's Warning

A SALESMAN told a story the other day. It wasn't an unusual story. Probably he knows a hundred similar stories. But this time he was so hopping mad that he didn't even sputter. He merely announced a decision. That decision should warn the business world.

The salesman had called on a minor engineering executive of one of the West's most important firms. He wanted the engineer to buy, say, a new kind of slide-rule. When the telephone operator on the main floor called upstairs and asked the engineer if he would see the salesman, however, the engineer answered no. Flatly.

The salesman was not satisfied. He called the engineer himself. "This is John Jones of the Slide-Rule Company," he said. "I wondered—"

"I'm not interested," the engineer shouted. "Why should I be? Why can't you damn salesmen leave me alone when I'm busy?"

The salesman knew what he was up against then. But even though his own temper was rising, he refused to quit without further sparring.

To no avail, however. Every time he started a sentence the engineer cut him off. And finally the engineer pitched his voice at a new high and roared: "Get the hell off that phone and leave me alone." He slammed down the receiver.

The salesman turned slowly and a little stiffly to the telephone operator. "Is there anything wrong with Mr. Soandso today? Is he sick or something?"

"Not that I know of," the girl said.

The salesman saw red. He had taken as much discourteous treatment as any man can stand. He had tried to find an excuse for the engineer. Now his feeling got the better of him.

He left seething. "If you think I'm going to buy any more of that plant's products," he told us, "you have another think coming. Any company that keeps a bird like that on its payroll—"

The story points up two sets of questions.

First: What would you think about the engineer's company if this had been your salesman? What do you think the engineer would have thought if one of his company's salesmen had received such unmannerly treatment at your hands?

Second, and more important: What chance has a firm in this upset world if its employees antagonize outsiders against purchasing its products? Don't you feel that our salesman friend had a perfect right to boycott the engineer's firm and to ask his friends and family to boycott the firm? Don't you think it was natural for our salesman friend to condemn the whole company because of the minor engineering executive?

Then don't you think that all companies should see to it that their employees—and particularly those technical employees who care only about a straight line and perfect circle and nothing about human relations—learn how to meet and treat salesmen, information-seekers, customers, the public with courtesy?

Because—remember this—a story like this gets around. And the more it gets around the more it is magnified. And the more it is magnified the more bitter the public becomes. And when the public is bitter sales begin to decrease. And when they decrease—the rest is obvious.

These questions, arising from our salesman's story, are serious. But their solutions, no less serious, are simple.

First: Do as you would be done by.

Second: See that your employees—and you—know how to keep a civil, mannerly tongue in your heads. Otherwise, bury yourselves.

ELECTRICAL WEST

DEVOTED TO THE ECONOMIC PRODUCTION, TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER AND ITS APPLICATION TO INDUSTRY, COMMERCE, AGRICULTURE AND HOME IN THE PACIFIC EMPIRE, AND TO THE MARKETING OF EQUIPMENT AND APPLIANCES AND OTHER UTILIZATION DEVICES IN THAT AREA

A Boost for the 1939 Fair

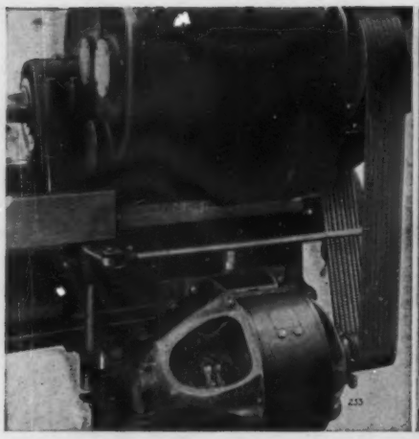
MAKE no mistake about it, the West will have an international exposition in 1939. And it will rival the counter attraction in New York in beauty, in exhibits, in interest-provoking features. It will outshine the PPIE of 1915 and all other expositions held in the U. S. in past years. These statements are not predictions, they are facts. They are offered to counteract the apathy, rumor and general lack of interest which some people seem to take in *our* fair.

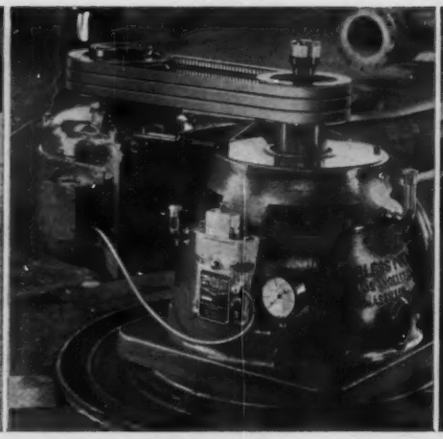
The electrical industry in particular has a real stake in the success of the Golden Gate International Exposition. Not because of its new and spectacular lighting; not because this is an electrical age and much that will be displayed will have an electrical tie. These benefits are so obvious that they should assure the interest and backing of the industry. There is a broader reason. The GGIE will attract upward of 2,000,000 visitors from east of the Rocky Mountains. Among these will be business men interested in the potential development of the West's latent resources. Among them will be thousands of potential residents of the West, people who will return later to make this region their home. These are latent customers for the whole electrical industry.

Those are some of the reasons why every member of the electrical industry here in the West should be a booster for the GGIE.

Wiring — Everybody's Problem

WIRING adequacy is receiving more attention from the industry today than almost any other problem. Yet there are many people who are apathetic. As a matter of fact every individual in the business has a definite interest in seeing that the highways which bring electricity into the home are wide and clear. Unless they are, the dealer cannot sell his appliances; the amount of energy the industry sells is restricted; the manufacturer and the wholesaler suffer loss of sales, and the contractor has fewer jobs. And finally the ultimate customer is dissatisfied with the whole industry because he does not get full electrical service. In this issue ELECTRICAL WEST devotes many pages to the several aspects of this theme with the idea that only through coordinated cooperative effort will the answer be found.





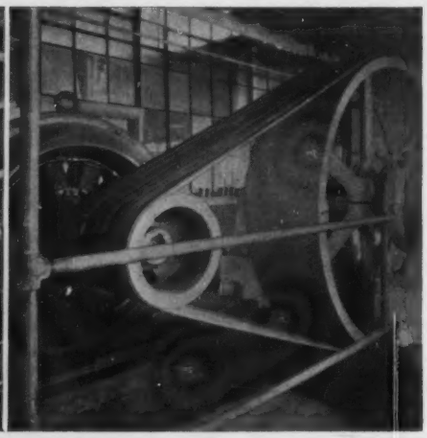


Fig. 3 (left)—Motor mounted on vertical sliding base in machine tool installation. Fig. 4 (center)—Drives may be placed at almost every angle as shown here. Fig. 5—A compressor V-flat drive using a large flat pulley and a grooved motor pulley

Rules for Using V-Belt Drives

By WARREN C. WEBB
Pacific Coast Representative
Dayton Rubber Mfg. Co.
Industrial Division

V-BELT drives are easy to install and simple to operate. Close attention to the following points will insure the most satisfactory operation and maximum belt life. The motor should be mounted on a sliding base, or other means provided for adjustment of center distance. Before installing the belts, see that the pulleys are in alignment and that the shafts are parallel. (Fig. 3.)

Do not pry the belts over the pulley grooves, as this will injure the belts and greatly reduce belt life. Instead, the motor should be moved sufficiently forward on its base to permit placing the belts in the grooves and the center distance then increased until the proper tension is obtained.

As a general rule, the proper tension can be determined by striking the belts with the hand. When too much slack exists the resulting vibration will feel "dead"; when proper tension is reached, the belts will have a "live" vibration. It is not necessary to have the belts fiddle-string tight.

During the first few days of operation the belts will seat themselves slightly in the grooves and tend to slack. If necessary during this initial period, center adjustment should, therefore, be made to compensate for this seating action and assure proper tension. After these initial adjustments are made, frequent "take-ups" are unnecessary.

Belt dressings are not required and should never be used. Belts should be kept clean and free from oil. If oil cannot be avoided, use oil-proof V-belts. When V-belt drives are totally enclosed, adequate ventilation for the drives should be arranged. (Fig. 4.)

Flat pulleys of the usual materials, such as cast iron, pressed steel or wood, have been found completely satisfactory for the larger pulleys of V-flat drives. Crown face pulleys are not usually recommended. As a rule, the crown will cause a slight increase of the tension between the center and outer belts of the drive and also may tend to cause "crowding" of the belts toward the peak of the crown. Therefore, when an existing crown face pulley is to be used in a V-flat drive, the crown should be removed. Crown face pulleys may be used, however, where the drive consists of only two belts—one belt riding on each side of the crown. (Fig. 5.)

When using the V-flat drive, there are certain limitations from the standpoint of efficiency which keep this drive within certain limitations of speed ratio and center distances. When kept within the proper limitations of speed ratio and center distances, such a drive will operate with complete satisfaction, using approximately the same number of belts that would be required with both pulleys grooved, and with all the usual advantages of the full V-belt drive.

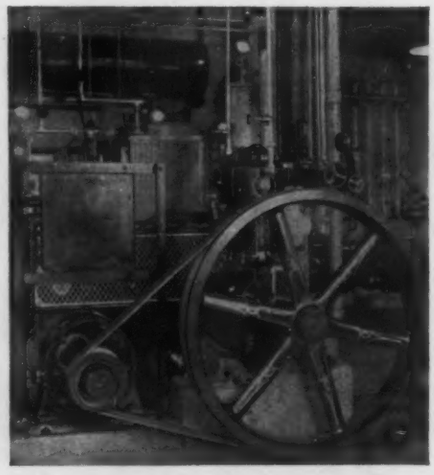


Fig. 6—In most cases, distances between shafts may be as close as the diameter of larger pulley

The maximum pulling power of V-flat belts will be obtained when the arc of contact on a large pulley is approximately 240 or 250 deg., and the arc of contact on the small pulley is, therefore, approximately 120 deg. or slightly less.

As a rule of thumb, the conditions for the use of V-flat drive will be most favorable when the speed ratio is at least three-to-one or more and the center distance is approximately equal to or slightly less than the diameter of the large flat pulley. Longer center distances may be used, but the longer distance centers will decrease the arc of contact on a large flat pulley, therefore necessitating a greater number of belts to prevent slippage on the flat pulley.

Because of their tremendous practicability, V-belts (operating on drives with both pulleys grooved or on a V-flat drive where the larger pulley is not grooved) are used in all industries from agriculture to oil, from rubber to textile, in every corner of the world. Today you will find them in the machine shops of the United States, the oil fields of California and Texas, the textile mills of the New England States, the diamond mines of South Africa and the gold fields of Alaska. (Fig. 6.)

Group Action

New association is set up by northern California distributors

Need of group action to deal with present-day problems and to further better trade relationship last month brought together northern California appliance distributors in a new California corporation known as the Pacific Appliance Institute. Membership of the institute, designed as a vehicle through which the manufacturer and distributor can act in relation to other branches of the industry and public, consists of major distributors and producers of radio and refrigerators in northern California. Arrangements are also being made to include distributors of other household appliances.

N. J. Etienne, for ten years in charge of the appliance department of Chanslor & Lyon Stores, Inc., San Francisco, was appointed secretary-treasurer and managing director.

Directors include Stanford Berry, Household Products Co., distributor of Servel refrigerators; H. R. Curtiss, H. R. Curtiss Co., distributor of Packard-Bell radio; George P. Egleston, H. R. Basford Co., distributor of Kelvinator and Zenith; Charles A. Goodwin, Jr., General Electric Supply Corp., distributor of G. E. radios, refrigerators, etc.; R. C. Gray, Remler Co., Ltd., manufacturer of a radio; H. E. Lapkin, Coast Radio Supply Co., distributor of Emerson radio and Gibson refrigerators; P. H. Lyon, Chanslor & Lyon Stores, distributor of Norge and RCA, and Caleb Sharrah, Thompson-Holmes, Ltd., distributor of Philco radio and Stewart-Warner refrigerators.

The organization is the result of a recent survey of what could be done in the trade to protect members of the industry against outside influences which tend to work hardships on the wholesale group. Studies were also made of what steps should be taken to abolish current discount houses, buying clubs and "wholesale merchandisers."

The institute will act to curtail certain types of advertising promotion known as "rackets", and will clear through its offices demands made upon wholesalers for gratis contributions to certain types of so-called civic events. It was also pointed out that the organization will be in a position to cooperate with the Electric Appliance Society of Northern California in sales campaigns and industry promotional activities.

By-laws describe the object and purposes of the institute to be: To devise ways and means of bettering the condition and advancing the interest of those engaged in appliance business, particularly in northern California. To foster friendly and harmonious relations among industry members. To disseminate knowledge among its members as to scientific management and merchandising. To formulate and encourage ethical trade practices and standards in the interest of more competition and public welfare. To correct trade abuses within the industry. And "to do any and all things not inconsistent with any present or future laws which may advance or improve conditions in the industry."

One of the first accomplishments of the institute was to uncover a pigeonholed radio interference ordinance upon which the industry worked for two years.

Merger

Two San Francisco contractor organizations combine

Merged last month was the Master Electricians' Club with the San Francisco Electrical Contractors' Assn., Inc. The move gives the latter a new high membership of 107.

R. H. Thompson, president of the electricians' club; James Surtees, secretary, and George W. Abbott, head of the committee for merger, were made ex-officio members of the association's board of directors pending changes in by-laws necessary to complete this phase of the consolidation.

Although the electricians' club members, largely residential contractors, will maintain their identity in order to deal with their own particular problems, the new enlarged organization will meet as a group Thursdays at association headquarters, 1434 Howard St.

IAEI Conventions

Programs are announced for Spokane and Long Beach meetings

Annual convention programs for both the Northwestern and Southwestern Sections, IAEI, were announced last month. The former section will meet in Spokane Oct. 3-6; the latter in Long Beach, Oct. 10-12.

Speakers addressing both meetings include: H. N. Pye, IAEI president; Victor H. Tousley, IAEI secretary-treasurer; J. W. Whittington, director, Electrical Cord Manufacturers, NEMA; A. Penn Denton, consulting engineer, Rigid Steel Conduit Assn., and L. F. Adams, assistant to the vice-president, General Electric Co. K. W. Keene, associate electrical engineer, Underwriters' Laboratories, Inc., San Francisco Testing Station, will present a sound film.

President E. B. Morrison will preside at the Northwestern convention. Frank T. Post, chairman of the board of directors, Washington Water Power Co., will welcome the convention.

Entertainment includes a trip to Grand Coulee Dam Oct. 6; lunch and dance Oct. 3; annual dinner and dance Oct. 4; luncheon preceding golf tournament and a stag party that evening Oct. 5. Inspectors' code breakfasts will be held daily.

Southwestern Section will depart from the usual committee reports and speakers will discuss assigned topics of interest: "Capacitors and Power Factor Correction," "Synthetic Insulating Liquid for Transformers," "Special Conduit for Installation in Corrosive Atmosphere," "The Non-Tamperable Fuse Situation," etc. Dr. Phillips Thomas, Westinghouse Electric & Mfg. Co., will speak on "Adventures in Electricity."

Entertainment includes a trip to the Richfield Oil refining plant; annual banquet Oct. 11; a ride on a Goodyear blimp; code breakfasts Oct. 11 and 12. A wiring material and equipment exhibit will be held at the Long Beach auditorium.

President Edward M. McLaughlin of Richmond, Calif., will preside.

On Your Mark—Go

And off its mark jumps the new Los Angeles Chapter, NECA

New Los Angeles Chapter, NECA, an amalgamation of several recently disbanded southern California contractors' organizations, went into action for the first time June 30 when A. L. Stone was elected president.

Clare Smallcomb was named vice-president; J. B. Shamel treasurer; Joe Newitt, executive secretary; Roy Littlejohn, Claire J. Bennett, R. R. Jones and J. E. Irwin, directors, and Roy Gruendler, former field representative for the California Electrical Contractors' Exchange, field man.

The organization, which already counts 39 members, will be immediately concerned with the wiring modernization program in which the Electrical Development League of Southern California and other branches of the industry are cooperating.

New Westminster & Fraser Valley (B. C.) Electrical Assn., an affiliate of the Vancouver Electrical Assn., closed its season last month with the following achievements: Educational work brought to the attention of members the evils of price-cutting. Developed was a new electrical code for the City of New Westminster. A number of social gatherings contributed to the strengthening of goodwill among the trade.

NEWS OF THE INDUSTRY

L. A. BUREAU TO BUILD THIRD BOULDER CIRCUIT

Construction of a third transmission circuit from Boulder Dam to Los Angeles was announced last month when Secretary of Interior Ickes and Arthur J. Mullen, president of the L. A. Board of Power & Water Commissioners, signed an agreement permitting the Bureau of Power & Light to take an additional large block of Boulder energy.

The agreement, which eliminates from present consideration the building of a steam generating plant to serve the city, provides that the bureau will take certain minimum quantities of electrical energy, in varying amounts of 385,000,000 to 700,000,000 kw.-hrs., in addition to the amounts which it is now obligated to take. It will pay the prevailing rate for secondary energy of ½ mill per kw.-hr.

The agreement also establishes a scientific formula for fixing the rate for secondary energy in any future adjustments of Boulder power rates during the 50-year lease period.

Other terms include the extension to 50 years of the present 10-yr. payment period for use of power plant machinery and equipment installed by the U. S.; extension of absorption period privileges with respect to power allotted to the L. A. Gas & Electric Corp. but assigned to the power bureau; provision for the delivery of water for the generation of additional firm energy during temporary periods of emergency.

The new circuit, which will cost approximately $13,000,000, will increase the bureau's Boulder transmission facilities by 150,000 kw. The contract requires the city to construct, operate and maintain the circuit as well as necessary switching and receiving stations and other facilities. First of the additional power must be taken not later than Dec. 1, 1939.

Formula by which the sale price of secondary energy will be calculated at future readjustment dates is, in effect, as follows: The price of secondary energy at load center will be calculated on the basis of the price of firm energy minus the cost of standby plants and other equipment necessary to render the secondary energy as reliable as firm energy.

FIFTY-YEAR LICENSE for company development on the Crooked River, Ore., has been granted Inland Power & Light Co. by the Federal Power Commission.

DISSOLUTION OF the Bidwell Municipal Utility District comprising most of Butte County, Calif., was voted in a special election, June 28. Unofficial count showed 3,033 voters in favor of disbanding the district, 2,465 opposed. The district was organized three years ago for the purpose of engaging in the electrical utility business in territory already served by the Pacific Gas and Electric Co. Dissolution was proposed because the directors had made no progress toward building or buying a distribution system although taxes had been levied. A small majority favored retention of the district in rural areas but the vote in Chico, largest city in the county, was enough to offset this.

FRESNO DISTRIBUTION TO BE PUT UNDERGROUND

Five-year program to place the City of Fresno, Calif.'s entire downtown electrical distribution system underground was launched July 20 by San Joaquin Light & Power Co. Estimated cost of the project will be $50,000 a city block, or approximately $400,000 a year.

The first year's work will involve eight blocks in the heart of the business district. Distribution lines will be in 4-in. ducts, four primary and three secondary, encased in concrete a minimum of 6 ft. 8 in. underground. Poles and wires of the present system will be removed as fast as the conduit is installed.

Plans for the following year's work have not yet been completed.

BIDS FOR FURNISHING and installing three 108,000-kva., unity-power-factor, 120-r.p.m., 13,800-volt, three-phase, 60-cycle, vertical-shaft, a. c. generators for the Grand Coulee power plant will be opened by the Bureau of Reclamation Aug. 18.

IMMEDIATE START on the installation of generating equipment at Fort Peck Dam, Mont., has been assured by the Secretary of War's allotment of $1,700,000 for this purpose from general river and harbor funds.

TO MEET AN ASSERTED power shortage the Burbank, Calif., city council has ordered plans prepared for a $900,000 steam generating plant. Application for a federal grant of $405,000 to build the plant has been authorized. A $350,000 bond issue will be placed on the November ballot for ratification.

BONNEVILLE-VANCOUVER LINE WORK ABOUT READY

Bonneville administration moved last month to bring power to western Oregon and Washington when it called for bids on 240 mi. of conductor to be strung on a 36-mi., 220-kv. transmission line from Bonneville powerhouse to Vancouver, Wash., and received a $1,080,988 WPA grant to clear the right-of-way for the line.

Bids on the conductor, either copper or aluminum, are to be opened Aug. 10. Traversing mountainous country on the north bank of the Columbia River, the line will for 12 mi. pass through a region of extreme weather. Here unusually heavy towers will carry conductor specified to withstand 8 lb. per sq.-in. of wind when loaded with 1 in. of ice.

The WPA money will be used to clear a path 300 ft. wide through Clark, Skamania and Klickitat Counties. All materials, equipment and engineering for the work will be provided by the Bonneville project. Right-of-way will be purchased with funds from the $3,500,000 Bonneville appropriation granted by Congress at the last session.

Also allocated to the Bonneville project last month were $10,750,000 of PWA funds for the construction of four transmission lines and substations in Washington and Oregon. To be built under this allotment are: a 230-kv. line with substations from Bonneville to Grand Coulee via Yakima, Wash.—$5,390,000; a 110-kv. line with substations from Bonneville to The Dalles, Ore.—$569,000; a 230-kv. line with substations from West Vancouver to Aberdeen, Wash., and a 110-kv. line with substations from Kelso, Wash., to Aberdeen—$1,971,000; a 110-kv. line with substations from West Vancouver to Eugene, Ore.—$2,820,000.

Meanwhile the town of Cascade Locks, Ore., undertook to dispose of the Bonneville power it contracted for. At a special election July 6 the city voted 173 to 17 to amend its charter so that it might legally enter the power business. At the same time it authorized a bond issue of $12,000 to finance its distribution system. The ordinance authorizing the bonds provides that any deficiency in the operation, maintenance, etc., of the electrical system may be made up by taxing all city property "without limit."

Carrying out this plan, the city council adopted a resolution July 11 asking

Ross to place a value on the property of West Coast Power Co., now serving the city, preparatory to dealing with the company for purchase of the system.

Until such deal is made, however, it seems likely that Bonneville power will be an acute headache to Cascade Locks citizens. Only customer the city had for the power on July 8, when the city joined the celebration of the opening of the Bonneville lock, was the street lighting load.

●

Court Denies Rehearing of Hetch Hetchy Case

July 26—Federal Judge Michael J. Roche today denied San Francisco's petition for a rehearing of the Hetch Hetchy case. City officials said they would appeal to the U. S. Circuit Court of Appeals and possibly to the Supreme Court.

More muddled than ever was the San Francisco - federal government Hetch Hetchy power argument last month. Events which led nowhere came in order:

(1) Federal Judge Michael J. Roche made formal his April decision that the city, by disposing of its Hetch Hetchy power through Pacific Gas and Electric Co., is acting in violation of the Baker Act. Effective date of the order he set at Dec. 28, 1938.

(2) Secretary of Interior Ickes wired Mayor Rossi that until the city made some move to set up a municipal power system all PWA grants would be withheld from San Francisco. Ickes later charged that Rossi and city newspapers had misconstrued his language and that he had said nothing of the sort.

(3) San Francisco City Attorney O'Toole petitioned Judge Roche for a rehearing of the case. The judge issued an order entertaining the petition and gave the city two days to serve papers on the government's attorneys and the government ten days to answer. To keep rehearing proceedings within the term of the court, he extended the term 90 days.

(4) The Ickes-Rossi battle ended with both sides claiming a victory.

(5) U. S. Attorney Hennessey filed a 120-word answer to the city's petition for a rehearing and asked that the petition be heard July 18.

(6) City utility experts undertook a study of utility valuation in preparation for submission of a municipal power distribution plan to the voters this fall.

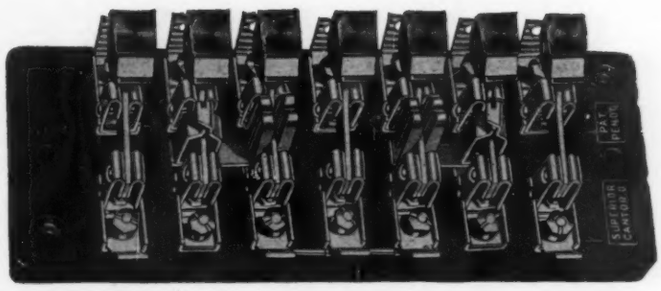
●

CONSTRUCTION OF the Colorado-Big Thompson project is expected to begin within 60 days now that the repayment contract has been approved by water users in the North Colorado Conservancy District who will be served by the project.

TEST SWITCHES

FOR

TESTING
CALIBRATING
DISCONNECTING
— METERS
RELAYS
INSTRUMENTS



Superior Test Switches are rugged and safe. Using the famous Superior "One-piece-jaw" construction they add a minimum number of joints to the circuit. They come in a variety of arrangements to meet your test switch needs.

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Superior Switchboard & Devices Company

CANTON, OHIO

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SUPERIOR

REG. U. S. PAT. OFF.

A. C. VAN SOELEN, corporation counsel, last month ruled that Seattle contractors doing city work, and not the city, must pay the state sales tax on materials. The ruling came in answer to a question raised by Schulman Electric Co., now installing galvanized steel structures in Seattle City Light's south substation at a cost of $25,000. The project is unusual in that only about 20 per cent of the cost is for labor. The company contended that it had not included the sales tax for materials when bidding for the work. Van Soelen held that the contractor is engaged in the business of improving real property, not selling materials to the city.

●

McLaughlin Airs Views on Grand Coulee, Bonneville

Puget Sound Power & Light Co.'s attitude toward power developments in the Northwest was clarified last month by President Frank McLaughlin's statement in a full-page newspaper advertisement. Answering the question, "What About Grand Coulee and Bonneville?" McLaughlin said:

"Notwithstanding our feelings about government in business, and while we believe that private enterprise best serves, we are not subscribers to, neitheir do we practice, dog-in-the-manger or dog-eat-dog tactics. We want to do the right thing. The taxpayers' money invested in such projects should result in a maximum public benefit. The savings of thousands of people invested in private power facilities should be preserved. The need of the hour is not more wrecking crews; the need of the hours is cooperative effort for the task that lies ahead—making where we live a better place for all of us.

"In keeping with this thought, such power developed from these projects as can be advantageously utilized should be made available to the private utilities for distribution by them, and any and all savings resulting from the purchase of such power passed on to the customer. To this end it is our purpose to cooperate fully with government and see to it that the greatest utilization of power from such projecs is obtained.

"Our desire is to continue to make genuine contributions to the growth and prosperity of the territory we are privileged to serve and to go hand and hand with the people of this state to the great destiny which is rightfully theirs."

●

NOW IN SERVICE is Nevada-California Electric Corp.'s enlarged Victorville substation, the junction of the company's high-voltage transmission lines from the hydro plants above Bishop and the Boulder Dam.

Polaroid Demonstrations Astound Electrical Men

Western electrical men who have seen so many new inventions in past years that they have become somewhat blasé in regard to them stared pop-eyed last month as George W. Wheelwright, 3rd, Boston, demonstrated the amazing feats of "Polaroid — the New Control of Light."

Wheelwright's lecture, covering, among other things, illumination without glare, three-dimensional motion pictures in full color and the creation of colors in colorless materials, was given in Denver, Salt Lake City, Spokane, Seattle, Portland, San Francisco and Los Angeles.

By rotating one of two transparent discs he held in front of his face, Wheelwright was able to black out his face completely. This ability of two

A Polaroid lamp eliminates glare from a glossy page (left). But where an acetate "cancelator" (right) is used, controlled light is changed to ordinary light and type is unreadable

sheets of Polaroid to stop light he explained as a crossing of their invisible structures. "Science believes light to consist of waves vibrating in all directions," he said. "Polaroid confines or combs these waves into one plane. When the second sheet of Polaroid is at right angles to the first, the single plane waves cannot get through the contrary 'optical slots' of the second sheet."

Ability of Polaroid to eliminate glaring reflection, Wheelwright explained, is based on the fact that this glare is caused by light waves vibrating horizontally in relation to the surface of the object. The useful light consists of vertical waves in the same light beam. When Polaroid is placed in front of a light source with its crystalline structure in a vertical position, all the light waves emerge in that vertical plane while the horizontal waves are absorbed by the Polaroid.

To demonstrate the principle, Wheelwright provided the audience with Polaroid spectacles, one lense of which was equipped with horizontally aligned crystals and the other with vertical crystals. An illuminated picture hung before the audience was difficult to see with the unaided eye because of the reflection. No appreciable difference was noted when the picture was examined through the horizontal lens. When the other eye and the vertical lens were used, however, the glare disappeared and the picture stood out clearly.

Interior illumination, Wheelwright said, was accomplished with a sheet of Polaroid in the proper position in front of the light source. Various applications along this line are already being made by lighting manufacturers.

Wheelwright said that Polaroid had more than 800 uses, one of the most important of which was the elimination of automobile headlight glare. He showed how the Polaroid spectacles used for the glare demonstration could be employed in the demonstration of three-dimension, four-color motion pictures. He also showed how colorless sheets of cellophane placed between sheets of Polaroid assumed all the colors of the spectrum and how these colors changed as one Polaroid sheet was rotated.

●

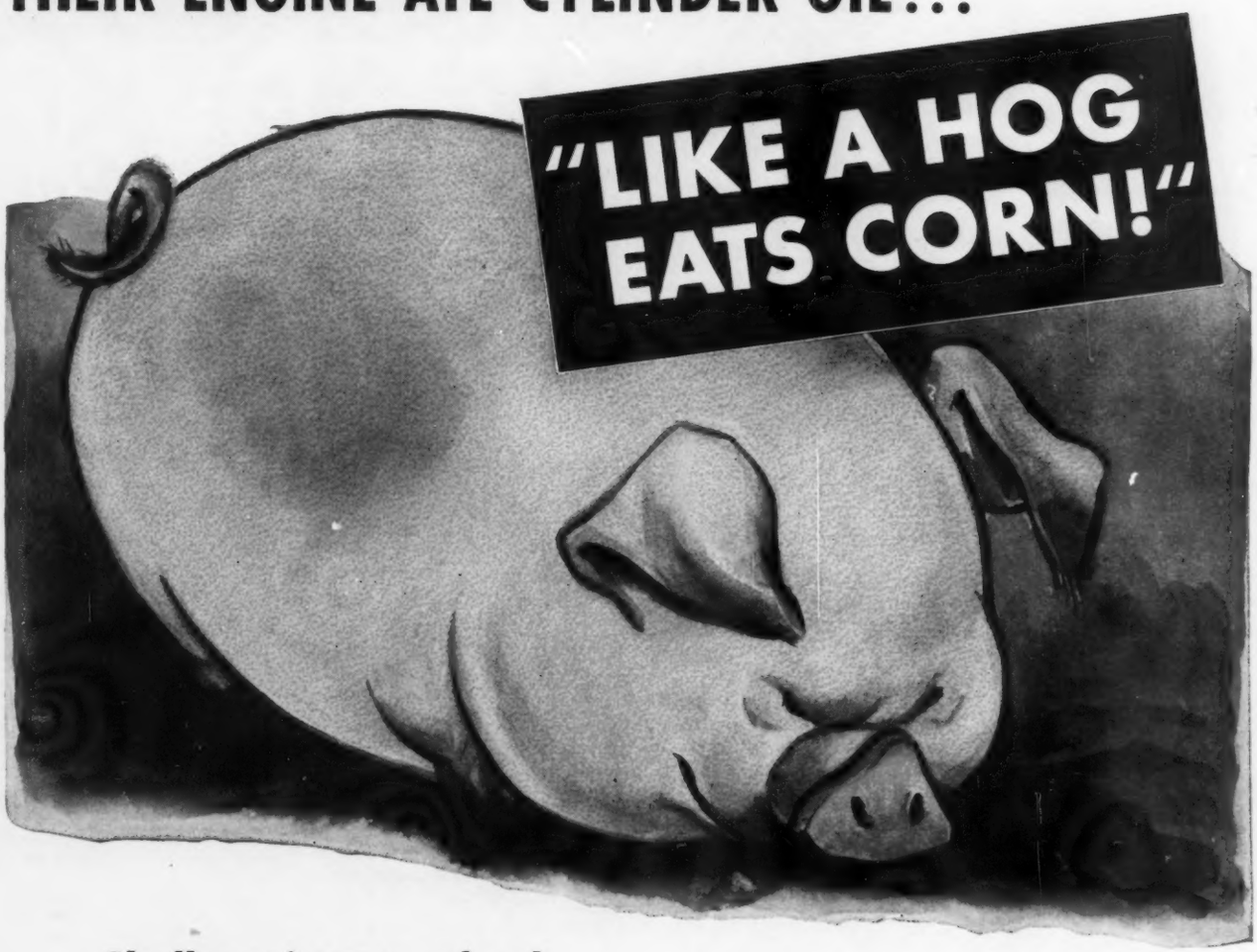
Boulder-Water District Power Contract Revised

Contract revising the terms of the original Boulder power contract with the Metropolitan Water District of Southern California was signed July 14 by Secretary of Interior Ickes. Under the new terms, the district is allowed a longer time in which to use its full amount of power without reducing the totals which must eventually be paid to the government.

Date on which the district is required to take the first of its power is thus extended from June 1, 1938, to June 1, 1940. The district is given fifteen years thereafter before it will be required to take all the 36 per cent of the total of Boulder power for which it contracted in 1930.

The district's monthly deficiencies will be computed on the basis of the difference between its obligation under the original contract and that of last month's revision. The district will pay 4 per cent interest on these deficiencies. The deficiencies accumulated to June 1, 1955, become the principal of an obligation which the district must retire with interest at 4 per cent by June 1, 1987, when the contract terminates.

THEIR ENGINE ATE CYLINDER OIL...



Shell engineers solved this company's problem in steam-cylinder lubrication

WHEN the Shell engineer arrived at the Comet Rice Mill in Beaumont, Texas, he found it in an uproar, fighting to keep up with the demand for its nationally famous Comet Package Rice. The steam engine powering the mill was failing under maximum loads because of improper cylinder lubrication. Freighters were waiting at the wharf . . . markets were changing . . . buyers were clamoring for deliveries—yet production continued to drop.

The Shell representative examined every detail of operation, found that the engine's cylinders had been re-bored and that they were eating up cylinder oil—as the mill men said—"like a hog eats corn!"

Calling on his experience in steam-cylinder lubrication, the Shell engineer recommended the use of Wolco 82E, a cylinder oil tough enough to fight heavy loads and suitably compounded to handle the saturated steam conditions.

Today, after over a year's operation, Shell Wolco Oil 82E is still doing the job for the Comet Rice Mill. Production is brought up to maximum at a moment's notice. Shipments are made with no delays—and Shell's *plus* has again solved a problem of industrial lubrication.

. . .

This *plus* of ours is important to you. It is a combination of vast resources, years of research, applied by thoroughly experienced representatives. It is always available for the solving of your lubrication problems. Simply call or write your nearest Shell office.

SHELL

SHELL INDUSTRIAL LUBRICANTS

the ***NEW***

Toastswell

MATCHED LINE IS NOW READY!

● ***The Most Modern***

Fastest Selling—Long Profit Line of Electrical Appliances Ever Offered—Backed Up by a Success-Proven Design and a Sales Increase of Over 100%.

● ***Think of it,***

Toastswell now offers you a smart new combination automatic sandwich toaster and a stunning new automatic waffle baker designed to perfectly match the now famous, ultra-modern Toastswell automatic two-slice and four-slice bread toasters which have increased dealer's sales beyond their greatest expectations.

TOASTSWELL TWO SLICE AUTOMATIC TOASTER

$10.95

Equipped with Time Master Control that assures uniform toast at all times, and low heat feature that keeps toast hot and makes delicious melba toast.

Non-automatic toasters and tray sets also available.

TOASTSWELL FOUR SLICE AUTOMATIC TOASTER $15.00

Toasts four slices of bread on both sides at one time. Same mechanical features as two slice toaster.

Non-automatic toasters and tray sets also available.

TOASTSWELL Automatic COMBINATION SANDWICH TOASTER $7.95

Non-automatic sandwich toasters and tray sets also available.

TOASTSWELL Automatic WAFFLE BAKER $9.95

Beautiful tray set with syrup and batter pitchers also available.

AND BEST OF ALL Toastwell is offering for a limited time only, two big extra profit deals that you can't afford to miss.

WRITE TODAY for complete information on the new matched Toastswell line and the two big profit deals and join the thousands of Toastswell dealers who are increasing their sales and profits with Toastswell every day!

UTILITY ELECTRIC CO.

624 TOWER GROVE AVE. ST. LOUIS, MO.

The new contract also provides that the district shall operate and maintain its own transmission line from Boulder Dam to its aqueduct on which power will be used for pumping water to the southern California coastal plain from Parker Dam. Originally it was provided that the City of Los Angeles should operate and maintain the line.

●

REORGANIZATION PLAN drawn up by the Bondholders' Protective Committee representing bondholders of Mountain States Power Co., now being reorganized under Section 77B of the National Bankruptcy Act, was heard by the SEC last month. The plan proposes to substitute new 6-per-cent bonds for the company's old 5-per-cent and 6-per-cent bonds, par for par; to convert the present preferred stock to common, and to give Standard Gas & Electric common stock for its open account charged to the power company. Present common stock would receive nothing.

●

APPLICATION FOR APPROVAL of an issue of $700,000 principal amount of three-year notes bearing 4½ per cent interest has been filed with the Federal Power Commission by Nevada-California Electric Corp. Proceeds are to be used toward refunding outstanding short-term notes maturing in December 1938 and April 1939.

●

WASHINGTON SUPERIOR COURT last month upheld the King County election board which had ruled that the question of organization of a public power district in the county be submitted to voters at the general election this fall. The decision overruled objections by railroads and timberland owners that the election could not be held because proponents failed to secure sufficient signatures on the petition calling for a vote and because their lands would receive no special benefits from the proposed district.

●

CONSTRUCTION BY Nanaimo-Duncan Utilities, Ltd., of a $125,000, 60,000-volt line from Nanaimo to Duncan, B. C., was scheduled to get under way last month. The line, which will be completed by Nov. 1, will give an additional 5,000 hp. to the Nanaimo plant.

●

SAND AND GRAVEL PLANT at Grand Coulee Dam is being rebuilt so as to increase the placement of concrete at the dam from 14,000 to 18,000 yd. per day.

●

CONSTRUCTION OF an additional $35,000 district substation in Yakima, Wash., has been authorized by Pacific Power & Light Co. The station, the third serving the city, will be fed from an 11,000-volt feeder from the Union Gap substation and will be of the outdoor type.

A $6,000,000 RENTAL HOUSING project, said to be the largest undertaking of its kind ever constructed under private ownership, was announced for the east side of Los Angeles last month by the D. Herbert Hostetter Estate of that city. The project will consist of 142 two-story structures containing 1,102 living units divided into three, four-and-a-half and six-room apartments and flats—a total of 4,443 rooms. Walls will be completely insulated for sound and air conditioning. Construction will be under the supervision of the rental housing division of FHA, with David J. Witmer and Loyall F. Watson, Los Angeles, as architects. Contracts will be let this month.

●

MOVEMENT TO GRANT Utah Power & Light Co. a 10-yr. franchise to operate in Provo, Utah, gained headway last month when petitions calling for a vote on the question were circulated. The action was the result of efforts by a group of citizens to prevent the city from constructing its proposed municipal power plant.

●

IDAHO POWER CO.'s new Caldwell substation, which permits the transmission of electricity from Upper Salmon to Caldwell at 132,000 volts, was energized in June, three months after work started. Five 66,000-volt transmission lines go out from the terminal to Ontario, Parma, Boise, the Gem Irrigation District and the old Caldwell substation.

●

NEW FORM of contractor's questionnaire requiring the names of all officers of a firm submitting a bid for a city contract of any nature has been approved by the Seattle Board of Public Works. The questionnaire will be required only when the board deems it advisable.

●

Contracts Awarded

BY BUREAU OF RECLAMATION for electrical equipment for Kendrick Project, Wyo. To American Transformer Co., Newark, for four 10,000-kva. transformers for the Seminoe Dam power plant, $174,090; to Pacific Electric & Mfg. Corp., San Francisco, for four 5,000-kva. transformers for the Greeley substation, $67,600; to Memco Engineering & Mfg. Co., Long Island, N. Y., for four 2,500-kva. transformers for the Cheyenne substation, $24,460; to Graybar Electric Co., New York, for poles for the Seminoe Dam power line, $105,873.

TO UNDERGROUND CONSTRUCTION CO., Oakland, for relocating floodlighting at Hamilton Field, Calif. $989.

TO AMERICAN ELECTRIC CO., San Francisco, for electrical work on junior high school unit and administration building at Coalinga, Calif. $8,615.

BY PACIFIC GAS AND ELECTRIC CO. to H. H. Larsen Co., San Francisco, for constructing

three reinforced concrete Bay Bridge substations, and to Dinwiddie Construction Co., San Francisco, for constructing Treasure Island substation.

To NePage McKenny Co., Seattle, for installing night lighting system at Fort Lewis, Wash. $9,975.

To Raisler Corp., New York City, for air conditioning post office at Tucson, Ariz. $149,700.

By Bureau of Reclamation for main control equipment and current transformers, station-power switchboard, distribution cabinets and miscellaneous equipment, metal-clad switchgear and two 5,000-volt, 200-amp. oil circuit breakers with frame mounting for installation in Seminoe power plant, Kendrick project, Wyo., to Control Corp., Minneapolis, $12,565; to Powerlite Switchboard Co., Cleveland, $4,607; to Bowie Switch Co., San Francisco, $37,115; to Wolfe & Mann Mfg. Co., Baltimore, $695.

To N. A. Russell, Santa Rosa, Calif., for electrical work in new building at state hospital, Eldridge, $6,783.

To Vancott Co., Los Angeles, for electrical work on new ward building at Pacific Colony, Spadra, Calif., $6,547.

●

REA Activities

Quinault (Wash.) Light Co. has awarded a contract to NePage McKenny Co., Seattle, for constructing 24 mi. of line, $26,283.

Sun River Electrification Assn., Fairfield Mont., has been allotted $74,000 to build 74 mi. of line to serve 225 customers in Teton and Cascade Counties.

Yellowstone Valley Electrification Assn., Huntley, Mont., has been allotted $144,000 to build 128 mi. of line to serve 425 customers in Yellowstone, Carbon and Stillwater Counties.

Nehalem Valley Cooperative Electric Assn., Jewell, Ore., has been allotted $17,000 to defray expenses connected with initial operations.

Wheatland (Wyo.) Rural Electric Assn. has been allotted $3,000 to complete the project.

San Luis Valley Rural Electric Cooperative, Inc., Monte Vista, Colo., has been allotted $1,500 to finance house wiring and plumbing installations.

Farmers Electric Membership Corp., Clovis, N. M., has been allotted $10,000 to finance house wiring and plumbing installations.

Orcas Power & Light Co., has awarded a contract to Westinghouse Electric Supply Co., Seattle, for furnishing customers' meters on the company's project at Orcas Island, Wash.

Power survey of the east end of Adams County, Wash., was being made last month by an REA committee headed by Richard B. Ott. Application is to be made for a project in the county.

Inland Empire Rural Electrification Assn. engineers were at work in Garfield County, Wash., on a preliminary survey for a rural line.

THE PROTECTION YOUR SYSTEM DESERVES

Slotting of the external surfaces of the ferrules is another recent improvement furnished on sizes 4 and 5 S&C Fuses, to provide greater heat radiation and further increase the reliability of the fuse.

• Long years of dependable performance have earned for S & C Fuses the top place in proven protection.

Continuous improvements over many years make the *S & C Liquid Fuses of today* the most accurate and dependable fuse for high current-interrupting ratings.

With *your* system each year demanding a higher degree of reliable protection—it deserves all that the S & C Liquid Fuse can provide.

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Salt Lake City.....Riter Engineering Co., Kearns Bldg.

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Made in capacities from ½ to 400 amperes, 7500 to 138,000 Volts.

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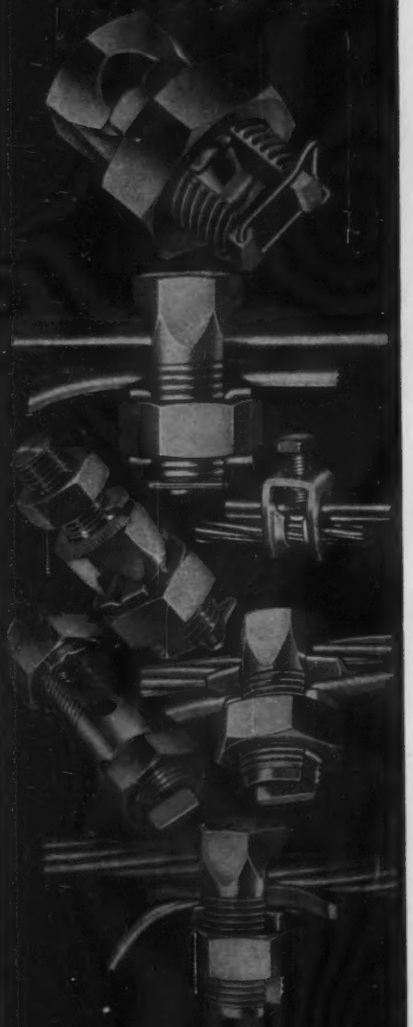
Reliable

SOLDERLESS CONNECTORS



Reliable connectors are available for use with all types of conductors. Tap connectors for copper, copperweld, aluminum and steel conductors and for guy strand are manufactured with precision threads to maintain high pressure solderless connections.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
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ABOUT PEOPLE

Northwest Association Elects LeRoy Grettum President

LeRoy A. Grettum, operating manager of Eastern Oregon Light & Power Co., Baker, Ore., has been advanced by election from the vice-presidency to the presidency of the Northwest Electric Light & Power Assn. He succeeds W. C. Mainwaring, general sales manager of B. C. Electric Railway Co. J. E. E. Royer, vice-president and general manager of Washington Water Power Co., is vice-president.

New vice-presidents for each state and province in the association's territory are: Idaho—Ralph E. Gale, Idaho Power Co.; Montana—I. L. Comstock, Montana Power Co.; Oregon—O. B. Coldwell, Portland General Electric Co.; Utah—George M. Gadsby, Utah Power & Light Co.; Washington—Frank Walsh, Puget Sound Power & Light Co.; British Columbia—E. H. Adams, B. C. Electric Railway Co. Additional executive committee members-at-large are: Hance Cleland, California Oregon Power Co.; R. G. Chamberlain, Hurley Machine Co., Seattle, and Harold A. Olson, incandescent lamp department, General Electric Co., Portland.

Appointed by Grettum as section chairman were: accounting & business practice—S. A. Horner, B. C. Electric Railway Co.; business development—W. A. Huckins, Utah Power & Light Co.; engineering & operation—A. Vilstrup, B. C. Electric Railway Co. Berkeley Snow, Portland, was named executive secretary.

●

John C. Jones Retires From Westinghouse

John C. Jones, for many years connected with the sales department of Westinghouse Electric & Mfg. Co., Los Angeles, retired June 30.

A graduate of the University of Nebraska, he entered the electrical industry with the Crocker-Wheeler Co. In 1900 he joined Westinghouse, for whom he worked until his retirement.

As sales engineer and, later, manager in the company's Salt Lake City office, Jones was active in the early irrigation and power developments of Utah and Idaho. In 1920 he was transferred to the Los Angeles office where he devoted himself exclusively to utility work.

●

GWYNN E. BISHOP, electrical design engineer for Portland General Electric Co., has been appointed assistant superintendent of the Portland Traction Co.

OUR COVER: Symbolic of the pathfinders of electrical service, contractors and inspectors, are these two men looking over wiring plans for the Golden Gate International Exposition. At left is Fay Lemoge, son and partner of Victor Lemoge, San Francisco electrical contractor who did the first wiring on Treasure Island; at right is Nick Siggins, electrical inspector from the San Francisco Dept. of Electricity assigned to the fair grounds.

●

Pacific P. & L. Names Till to Head New Department

W. H. Till, Pacific Power & Light Co. district manager at Pendleton, Ore., for the past nine years, last month took over duties as head of the newly organized industries department which will aid in the commercial and industrial development of the communities served by the company.

Succeeding Till at Pendleton is Homer Beale, district manager at Goldendale since 1932. Roderick McRae is new district manager of the Goldendale district, which has been combined with the Hood River-White Salmon district as the Hood River-Klickitat district.

According to George T. Bragg, company vice-president and general manager, the new department will cooperate with chambers of commerce and other groups in an effort to bring new industries to communities served, provide new outlets for the products of the region and add to employment and payrolls.

●

J. D. CARMICHAEL, chairman of the social committee of the Vancouver Electrical Assn., was in charge of the association's annual picnic for the electrical industry, July 23.

●

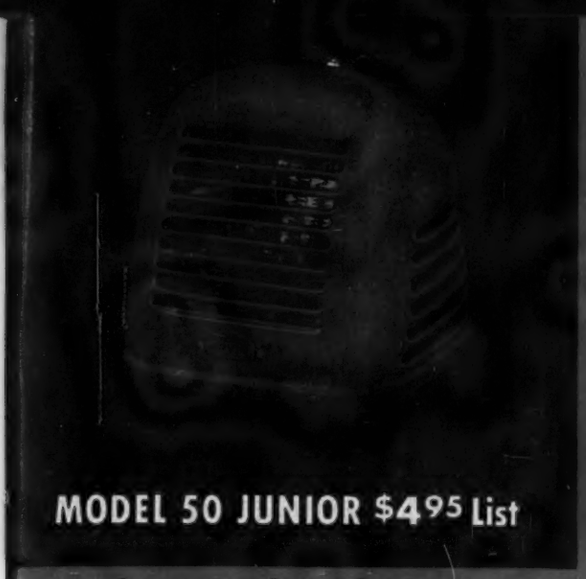
HAROLD PANGBORN has been appointed Nevada California Electric Corp.'s assistant superintendent in Coachella Valley, Calif.

●

A. B. SANBORN has resigned as manager of East Kootenay Power Co., Fernie, B. C., to accept a similar position with Northwest Service Co., Huron, S. D.

●

J. G. HAWKINS, former assistant treasurer and assistant secretary of Pacific Power & Light Co., has been elected treasurer of the company. He succeeds the late M. J. Wilkinson. Hawkins began his career in 1905, when he entered the accounting department of one of the predecessors of Portland General Electric. In 1909 he went to Astoria Electric Co., which was acquired by Pacific Power & Light Co. in 1910. He has been with the latter ever since.



MODEL 50 JUNIOR $4.95 List

● Actual size: 7½" high, 7¼" wide, 10½" deep.

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ARVIN

ELECTRIC

Fan-Forced Circulating

HEATERS

They CIRCULATE as they HEAT!

The efficient, healthful way to warm the air completely—for maximum comfort.

●

Selling in bigger volume than ever before.

Rural electrification, camp cottages and trailers have broadened the market for these efficient and economical circulating heaters. They sell fast because they are priced for volume turnover.

Circulating heat warms the air completely. It's the healthful, efficient way to obtain maximum comfort, heating engineers agree. Arvins *circulate* as they *heat*—drawing in the cold air, heating and circulating it at the rate of 45 cubic feet per minute.

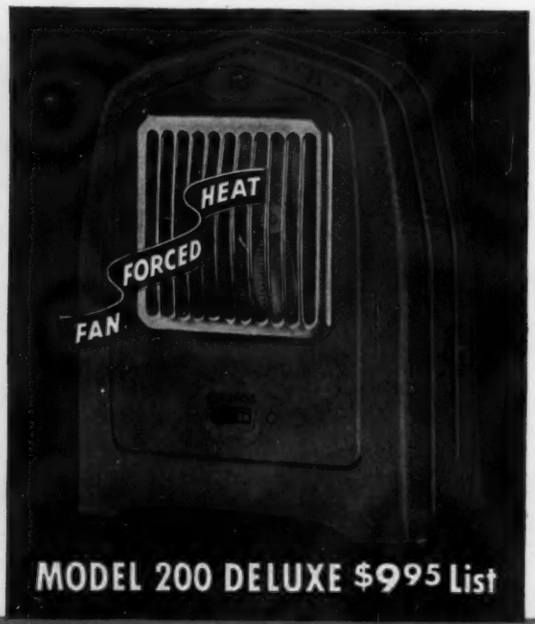
People buy Arvin circulating heaters for use in city and rural homes—for small offices, stores, ticket booths and hospital rooms—wherever extra or temporary heat is needed. Cash in on the fall and winter demand—order these Arvin profit-makers today.

NOBLITT-SPARKS INDUSTRIES, Inc. • Columbus, Indiana

● Actual size: 9½" x 5" base, 11" high.

MODEL 100 STANDARD $7.95 List

● Actual size: 10" x 5½", 13" high.



MODEL 200 DELUXE $9.95 List

ARVIN HEATERS HAVE MANY PRACTICAL USES—

For baby's bath, for shaving, dressing, drying hair and many other personal uses. Everyone likes the circulating warmth they provide—to drive out the early-morning chill in bedrooms and bathrooms.

All Arvin Heaters operate on 50 to 60 cycles, 110 to 125 volt. Induction type motors, fans and heating units are fully enclosed—making the heater perfectly safe. Heavy gauge steel cabinets in green enamel morocco finish. No radio interference. Rubber feet that can't scratch!

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Good Housekeeping Institute

H. I. England Takes Over Chairmanship of NEWA

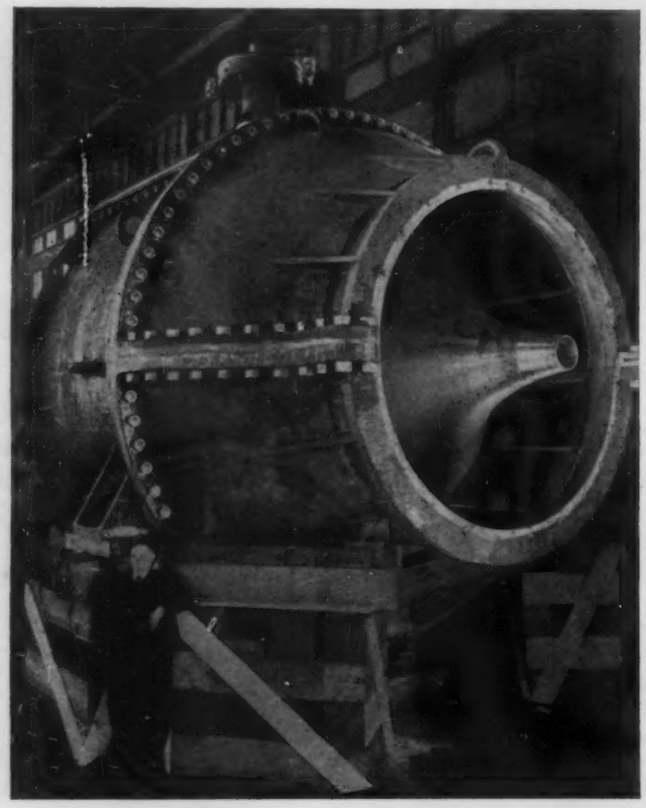
Henry I. England, president of Gilson Electrical Supply Co., Oakland, took office last month as chairman of the Pacific division, NEWA. He succeeded Burrell Manuel, Westinghouse Electric Supply Corp., Los Angeles. Albert Elliot, San Francisco attorney, is secretary-treasurer.

Committee chairmen are: Program—C. W. Goodwin, G. E. Supply Corp., San Francisco; entertainment—Fred C. Todt, G. E. Supply Corp., Los Angeles; golf—E. A. Phillips, Incandescent Supply Co., San Francisco.

H. M. CRAWFORD, late general sales manager of Pacific Gas and Electric Co., was winner of third prize under the Augustus D. Curtis Award, offered annually to the utility—and individual responsible—which does most to advance the artificial illumination of commercial and public buildings' interiors or exteriors. The award was announced at the Edison Electric Institute's convention a few days after Mr. Crawford's death.

●

HOWARD STULTZ, manager of Hollywood (Calif.) Wholesale Electric Co., recently returned from a trip to Hawaii and opened a new branch on W. Jefferson St.



180-ton Larner-Johnson Free Discharge Regulator designed by Pelton engineers. Shop view shows valve in full open position.

TWO discharge regulators of the Larner-Johnson type, designed and built in our San Francisco works, have recently been shipped for installation in the discharge works of San Gabriel Dam No. 1. They will be utilized for flood control service for the Los Angeles County Flood Control District.

Each unit measures 25 ft. in height by 30 ft. in length, weighs 360,000 lbs., and is capable of discharging 5600 second feet under full static head. Under shop tests of 215 lbs. sq. in. both valves were practically drop tight, indicating the extreme accuracy with which design and construction was carried out.

The Pelton Water Wheel Company

HYDRAULIC ENGINEERS

120 Broadway NEW YORK | 2919 Nineteenth St. SAN FRANCISCO | Paschall Station PHILADELPHIA

PELTON

MacInnes, Barnett Put in Charge of Oregon Utilities

Executive functions in West Coast Power Co., Western States Utilities Co. and California Public Service Co., Portland, subsidiaries of Peoples Light & Power Co., have been divided between W. C. MacInnes and F. G. Barnett. The action was taken by the boards of directors as a result of the death of M. V. Watson, general manager of the companies.

MacInnes has been named president and manager of West Coast Power Co., vice-president and manager of Western States Utilities Co. and manager of California Public Service Co. Barnett is president of California Public Service Co. and Western States Utilities Co. and operating manager of some of the properties of all three companies.

Prior to the appointments, MacInnes was operating manager for the properties under the supervisory contract held by Stone & Webster; Barnett was operating manager for certain of the properties under the same contract.

●

ESPECIALLY HONORED at Puget Sound Power & Light Co.'s annual celebration for employees who have completed 25 years in the company's service were Francis L. Wyman, member of the company for 48 years; Thomas Donovan, winner of the distinguished service medal for his rescue from a crashed plane of Ensign Bruce, U. S. N.; John Craig, E. C. Whiting and William Bennett, who had submitted the most constructive ideas for the advancement of their particular departments. Among the 30 persons initiated into the "old timers" group was Frank McLaughlin, president.

●

KENNETH M. FULLER, assistant sales manager of Wesix Electric Heater Co., Seattle, blasted a niche in golf's hall of fame when he canned his tee shot on No. 13 during the annual golf tournament of the Electric Club of Washington. The hole-in-one was the first made in club tournament play.

●

JAMES E. MCCAFFREY, executive head of the California Railroad Commission in Los Angeles since 1935, has been named chief engineer and general manager of the Sacramento Municipal Utility District. He succeeds Albert Givan, head of the district since its inception, who has been named consulting engineer. Except for a brief period in 1926 when he was assisting the Federal Power Commission in a survey of the Central Valley project, McCaffrey was a member of the commission's engineering staff for eighteen years.

WINNERS IN THE southern California Cookery Council's recent range contest were James Deegan, in the Los Angeles Bureau of Power & Light's salesmen's contest, and Charles Markson, Markson Electric Co., in the dealer salesmen's contest.

●

NEW ARRIVAL in the West is Warner M. Skiff, who retired as manager of the Nela Park engineering department of General Electric Co. June 30. Skiff will make his residence in southern California.

●

TOM KERBY has been appointed manager of the B & M Appliance Store, Butte, Mont.

●

ED DOWD, Dowd-Seid Electric Co., San Francisco, has been appointed chairman of the picnic committee which will stage the San Francisco Electric Contractors' Assn.'s all-industry picnic Sept. 25.

●

AL BAUGHMAN, formerly connected with Everhot Electric Co., Los Angeles, has joined the Los Angeles office of General Electric.

●

PAUL GERHARDT, formerly salesman for Goggans & Pennie, Great Falls, Mont., G. E. dealer, is now city salesman for Modern Utilities Co., Kelvinator dealer.

●

J. M. HOOPER, Seattle electrical contractor, has been elected vice-president of the Washington State and British Columbia Aerie of Eagles.

●

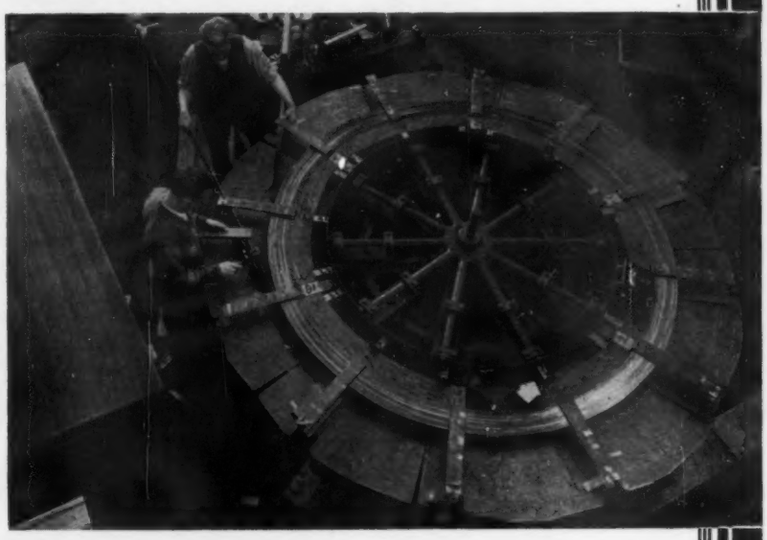
Speakers

At the radio & appliance trade dinner, fall market of the Western Furniture Exchange, San Francisco—Ralph C. Cameron, sales manager of household appliances, Kelvinator division, Nash-Kelvinator Corp.: "Crusading for Better Business." Vernon E. Vining, manager of department store sales, Westinghouse Electric & Mfg. Co.: "Clown Prince of Cuisine." L. J. Stutz, general sales manager, Majestic Radio & Television Corp.: "Common Sense in Radio Merchandising."

At July meeting of the Air Condiitoning Society of San Francisco—A. J. Bouey, B. F. Sturtevant Co.: "A Practical Discussion on Fans."

At the annual banquet of the Bureau of Radio & Electrical Appliances of San Diego County, purpose of which was to show appliance retailers and their salesmen the possibilities for business growing out of community activities—Maj. T. C. Macauley, executive secretary, San Diego Chamber of Commerce "San Diego County Business Prospects." Capt. E. W. Scott, U.S.N.: naval construction plans. A. E. Holloway, com-

Gardner Meets Rigid Requirements for World's Largest *"Atom Busters"*



☆ Scientists at the University of California and the Tokio Institute at Tokio, Japan, chose Gardner to wind the coils (shown above) for the two largest Cyclotrons, or "atom busters" in the world. Such confidence is a tribute to Gardner's precision manufacturing methods in building transformers that give long, trouble-free operation and economical performance.

GARDNER ELECTRIC MANUFACTURING CO.
4227 Hollis Street Emeryville, California

REPRESENTATIVES
Geo. E. Honn Co., 420 Market St., San Francisco, Calif.; Beeson Engineering Co., 2501 E. 52nd St., Los Angeles, Calif.; Industrial Electric Co., 1304 Stewart St., Seattle, Wash.; Modern Electric Co., 37 Richards St., Salt Lake City, Utah; Kranefeld Engineering Co., 3416 14th Ave., Denver, Colo.

GEO. E. HONN CO.

420 MARKET STREET SAN FRANCISCO, CALIF.

Gives Quick Service on Quality Products from Local Stocks

MANUFACTURERS' REPRESENTATIVES FOR:

PYREX INSULATORS
BREWER-TITCHENER HARDWARE
● Corning Glass Works

FUSES, CUTOUTS, DISCONNECTS, PROTECTIVE DEVICES
● Schweitzer & Conrad, Inc.

CAPACITORS
● Cornell-Dubilier Corp. World's Largest Exclusive Mfrs. of Capacitors

TRANSFORMERS
● Gardner Electric Mfg. Co. Power and Distribution Transformers
● Lee Skipwith & Co., Inc. Niagara Air-Insulated Current Transformers

CABLE GRIPS
● Kellems Products, Inc.

CONNECTORS, GROUND ROD CLAMPS, UTILITY HOISTS
● Jasper Blackburn Products Corp.

GROUND LINE POLE TREATMENT
● Osmose Corp. of America

METERING INSTRUMENTS
● Landis & Gyr, Inc.

CROMPTON TONG TEST AMMETER
● Columbia Electric Mfg. Co.

UNDERGROUND TOOLS AND EQUIPMENT
● T. J. Cope, Incorporated

TREE TRIMMING EQUIPMENT
● Bartlett Manufacturing Co.

FRICTION AND RUBBER TAPES
● Clifton Manufacturing Co.

CHROMALOX

...per-Speed

...RANGE

...UNITS

Hitting a new high in cooking speed, cleanliness, convenience, economy, and lasting qualities. Now standard on many ranges. Right for replacement, too—they fit all ranges.

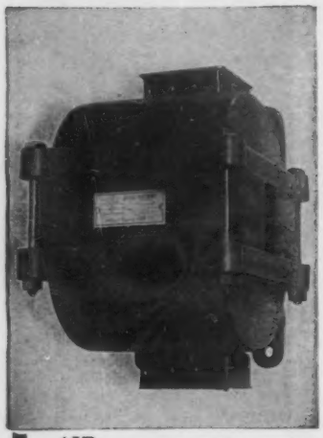
Represented by

MONTGOMERY BROTHERS
911 Western Ave., Seattle, Wash.
1501 N. W. Kearny St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
912 E. Third St., Los Angeles, Calif.

THE PETERSON COMPANY
1921 Blake St., Denver, Colo.

EDWIN L. WIEGAND CO.
7540 Thomas Blvd. Pittsburgh, Pa.

YOU SAVE



With JEFFRIES

AIR COOLED TRANSFORMERS

● With a Jeffries Air Cooled Transformer money can be saved. The Air Cooled construction lengthens the life of the transformer and lowers repair costs. Plant expansion and extension can be made economically for a Jeffries Transformer provides the voltage change at the point desired without the need of long and expensive conduit runs. Besides a complete line of standard transformers, special designs and voltage furnished to order. Type S. S. Transformer 1 to 5 K.V.A illustrated.

JEFFRIES TRANSFORMER COMPANY
5706 LONG BEACH AVE., LOS ANGELES

mercial vice-president, San Diego Consolidated Gas & Electric Co.: the meaning of the company's cooperative advertising and business-building work. J. Clark Chamberlain, secretary-manager of the bureau: a review of cooperative promotions of the past year; a preview of coming promotions.

●

Deaths

S. B. LOEWENBERG, 59, connected with General Electric and affiliated companies in Portland for 21 years, died of heart disease July 3. Mr. Loewenberg joined the company in 1917 as stock clerk; was transferred to the sales department of the Edison Lamp Works in 1923, and continued in that capacity, through the merger of the Edison and National Lamp Works into the incandescent lamp department of G. E., until his death.

●

A. R. FOSTER, 66, superintendent of the credit and collection department of San Diego Consolidated Gas & Electric Co., died June 15. He was born in Washington, D. C.

●

GEORGE P. JAMES, 70, former chief engineer of Puget Sound Power & Light Co., died in Seattle July 15.

TRADE NOTES

DISCONTINUED LAST MONTH was Frank J. Airey Co.'s representation in southern California and Arizona of Curtis Lighting, Inc. J. Arthur Bassett, connected with the Airey company for the past year, will continue as Curtis representative.

●

BILLINGS (MONT.) ELECTRIC Co. has installed a new street lighting system on First Ave., Billings. The lights, five times more brilliant than the old five-cluster type, are mounted on 24-ft. standards. Each globe supplies 15,000 lumens.

●

GOBLINE ELECTRIC CLEANER Co., Ltd., Toronto, Canada, has been incorporated as an extra-provincial company with offices at 207 Hastings St., Vancouver. The firm deals in vacuum cleaners of all kinds.

●

BOZEMAN (MONT.) SHEET METAL Co. has taken on the complete line of Kelvinator appliances.

●

HUDSON'S BAY Co., Vancouver, B. C., has consolidated its electrical appliance, radio and lamp departments, devoted increased space to the combined departments and installed a model kitchen.

NOW LISTED UNDER the re-examination service of Underwriters' Laboratories are porcelain knobs, tubes and cleats manufactured by Ceramic Specialties Co., Illinois Electric Porcelain Co., Knox Porcelain Corp., Porcelain Products, Inc., Specialty Porcelain Works, Superior Porcelain Co. and Universal Clay Products Co. and porcelain outlet and switch boxes manufactured by Porcelain Products, Inc., Illinois Electric Porcelain Co. and Knox Porcelain Corp.

●

OLATHE HARDWARE Co., Montrose, Colo., has been signed as new G. E. refrigerator dealer for the territory.

●

A. B. ECKERSELL, Rigby, Ida., furniture dealer, has taken on the Monarch line of ranges and water heaters.

●

TWO NEW DISTRICT OFFICES have been announced by San Diego Consolidated Gas & Electric Co. One has been established at 4189 University Ave. Another will soon be constructed at Second & Ditmar Sts.

●

FRANK TRUNK, Bozeman, Mont., plumbing and heating dealer, has taken on the Hotpoint line. H. Babcock has been named in charge of sales.

●

MACMILLAN ELECTRIC Co., Duncan, B. C., appliance store, has been extended to include an electrical contracting department and a radio service department. Managers of the new departments are Keith Francis and J. Stirling respectively.

●

MARSHALL-WELLS HARDWARE, Portland, has taken on distributorship of the B & F electric water heater.

●

H. EARL CLACK Co., Havre, Mont., is a new agency for Frigidaire ranges.

●

LIVINGSTON (MONT.) HARDWARE Co. has added G. E. appliances to its display.

●

TIPS TOOL Co. display trucks are touring the country offering movie presentations of methods for using hot line tools in maintenance work.

●

COLONIAL PREMIER Co., IES lamp manufacturer, will exhibit a new mural, "Evolution of Lighting," at the Golden Gate Exposition.

●

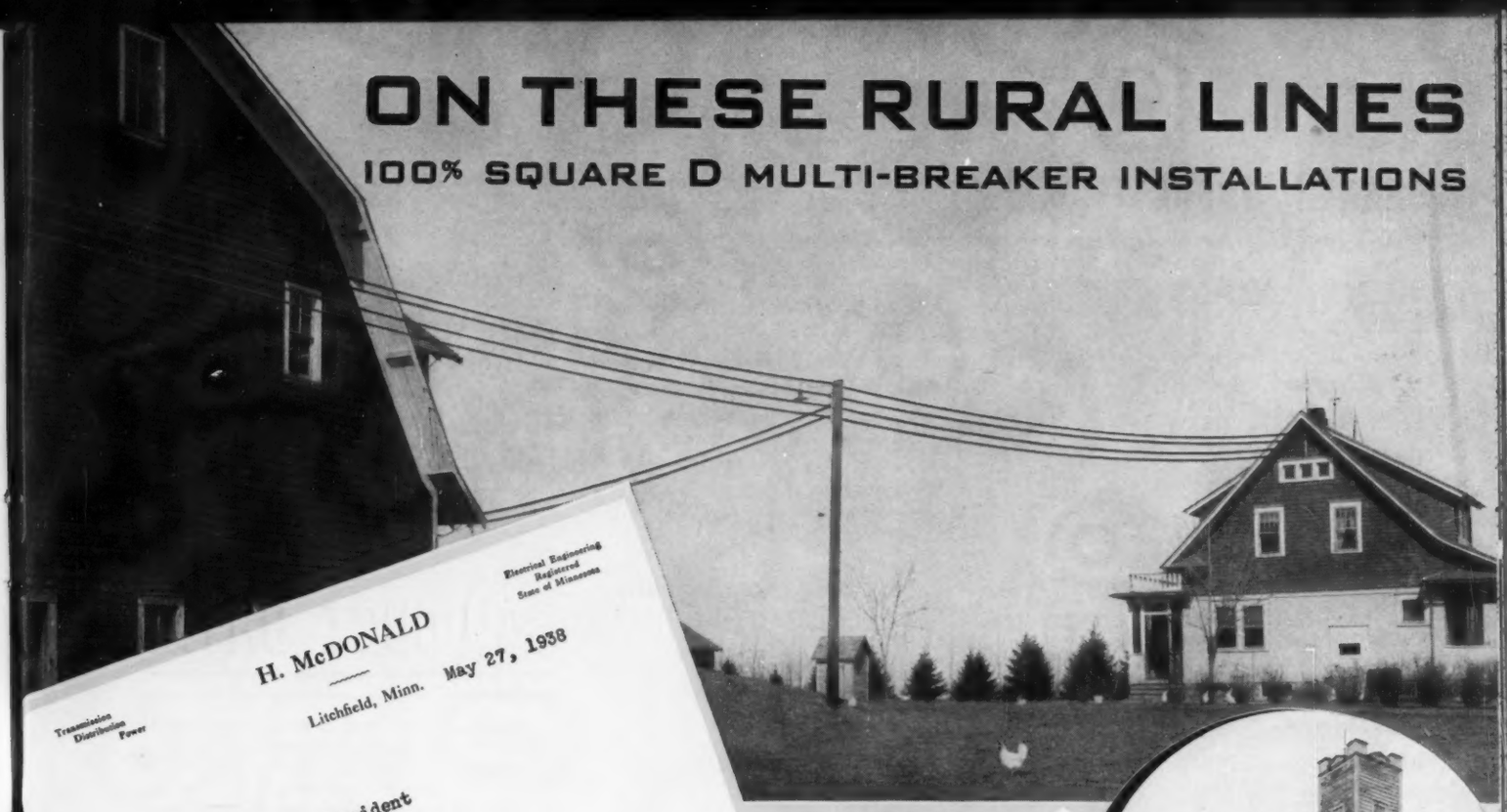
L. A. HAWSON is rushing completion of a new store at Penticton, B. C., to house his refrigeration and appliance business.

●

PECK BROS., Portland appliance store, is now handling Woolwine ranges.

ON THESE RURAL LINES

100% SQUARE D MULTI-BREAKER INSTALLATIONS



Transmission
Distribution
Power

Electrical Engineering
Registered
State of Minnesota

H. McDONALD

Litchfield, Minn. May 27, 1938

Mr. Robert H. Parker, President
Peerless Electrical Company
615 - Fourth Avenue South
Minneapolis, Minn.

Dear Mr. Parker:

The question of giving uninterrupted and dependable service to rural wiring installations has been a problem due chiefly to the fact that the farms are generally located a distance from service men, and during winter months and bad storms are sometimes very difficult to reach.

Bearing these facts in mind, I considered different protective devices and selected the Square D Multi-breaker and recommended its application to the problem.

About four hundred installations are now in use. No service calls have been made, nor any complaints as to their operation.

Yours very truly,

H. McDonald

H. McDonald
Engineer for
Meeker Cooperative Light
& Power Association

ON THE FARM

IN THE CHURCH

IN THE SCHOOL

IN THE STORE

● A whole community—nearly 500 services at present—equipped with Square D Multi-breakeRs. Rural electrification is creating a lot of this profitable business.

Let the Square D Multi-breakeR help you get your share of it. It is simple, reliable and tamper-proof. No fuses to replace. No needless service calls. Write for bulletin CA-543A if you want the complete Multi-breakeR story.

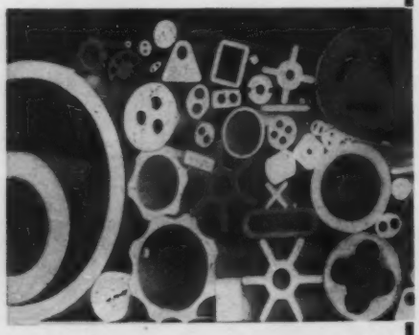
SQUARE D COMPANY

LOS ANGELES - MILWAUKEE - DETROIT

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

CALL IN A SQUARE D MAN

CERAMIC INSULATION
To Your Specifications



★ IN 36 YEARS, we have developed an enviable technique in manufacturing ceramics. Our Research Laboratory has added several new materials for special applications, both heat and electrical that take up where porcelain stops. Why not consult our representatives, shown below? Samples and literature are available upon request.

THE ELECTRIC MATERIAL COMPANY, INC., Room 225
163 Second Street, San Francisco, Calif.
THE ELECTRIC MATERIAL COMPANY, INC., Room 328
912 East Third Street, Los Angeles, Calif.

American Lava Corporation
CHATTANOOGA, TENNESSEE

How you can save
TIME

We can save the time you spend keeping records of transactions, collecting coupons, etc. . . . and perhaps save money, too, by helping to avoid losses due to mistakes and delays.

Our free booklet *An Introduction to Agency Service* tells how. Write or telephone for your copy.

Just ask for Booklet M3

CROCKER FIRST NATIONAL BANK
OF SAN FRANCISCO
California's Oldest National Bank

MISSOULA (MONT.) MERCANTILE CO. has installed a complete electric kitchen for demonstration purposes in the appliance division of its furniture department.

●

NORTHWEST ELECTRICAL & APPLIANCE SALES is a new store opened in Portland by Franklin Chaphe. The firm also does wiring and appliance repair work.

●

VALLEY ELECTRIC, new appliance store, has been opened at Vernon, B. C., by B. Lockhart, proprietor, and Guy Allen.

●

HOME ELECTRIC CO., Tacoma, Wash., has been named western Washington distributor for Rotarex Mfg. Co., Majestic Radio & Television Co. and Walker & Pratt Co.

●

CHINOOK (MONT.) MOTOR CO., Norge dealer, has changed its name to Bear Paw Motors, Inc.

●

WEISFIELD & GOLDBERG will devote one display room in their new store at Sixth Ave. and Washington St., Portland, to electrical appliances.

●

HUME ELECTRIC, Cranbrook, B. C., is a new appliance, contracting, appliance servicing and radio repair establishment opened by W. J. Hume.

●

TAYLOR BROS. CO., Provo, Utah, department store, has been appointed Hotpoint dealer for Provo and vicinity.

●

PALMQUIST ELECTRIC CO. and Allen Electric Co., Helena, Mont., have installed a floodlighting system on the Helena High School athletic field.

●

STREVELL-PATTERSON CO., Salt Lake City, has been named distributor in the intermountain territory for Estate ranges and refrigerators.

●

NORGE APPLIANCE CO. is a new store opened in Lewiston, Ida., by Sid Conner.

●

SUNSET ELECTRIC CO., Portland, has taken on distribution of Frigidaire electric water heaters.

●

Moved

NATIONAL ELECTRIC PRODUCTS CORP., Seattle, from Textile Tower to 1049 Sixth Ave. South.

FORST'S, LTD., British Columbia appliance store, from Granville St. & Broadway, Vancouver, to 1458 W. Broadway.

VALENTINE APPLIANCE CO., Salt Lake City, to 52 E. Fourth South. Joe Chlarson is moving to Brigham City, Utah, to manage the Valentine store there.

MONAHAN ELECTRIC CO., Los Angeles, from 3746 S. Vermont St. to 3706 W. Third St.

APPLIANCE ELECTRIC SERVICE, Los Angeles, from 1142 N. Western Ave. to 1030 N. Western Ave.

M. A. SIMCOE, Portland appliance dealer, from 1626 SE. Bybee to 6812 SE. Milwaukie.

MODERN UTILITIES CO., Great Falls, Mont., Kelvinator dealer, from the Paris Fligman Co. store to 208 Fourth St. South.

HAVRE (MONT.) FURNITURE CO., Westinghouse dealer, from Montana Power Co. offices to 210 First St. The company was burned out of its original building.

BLACK & DECKER & VANDORN, manufacturer of portable electric tools, to new service shop at 1941 S. Flower St.

PRODUCT DATA

Free to you . . . Any of these instructive bulletins simply by addressing a post card to ELECTRICAL WEST and asking for the desired bulletin by number.

801:
NETWORK PROTECTORS, light-duty type; pamphlet fully describing application, operation, construction and containing illustrations and diagrams of wiring and outline dimensions. Westinghouse.

802:
WESTERN RED CEDAR for poles; beautifully illustrated and printed, spiral-bound book reciting history of cedar and the story, treating specifications and advantages of western red cedar for transmission and communication poles. Western Red & Northern White Cedar Assn.

803:
KITCHEN PLANNING BOOK telling importance of an efficient kitchen, giving basic kitchen layouts, telling how to determine kitchen size and select equipment, explaining wiring and giving appliance specifications. General Electric.

804:
DISTRIBUTION FEEDER VOLTAGE REGULATORS; revised, illustrated bulletin describing principles of operation, major design features and field of applications. Allis-Chalmers.

805:
"THEORY OF VIBRATION CONTROL;" reprint of a comprehensive treatise on machinery vibration transmission and its elimination. Also explains types and applications of anti-vibration products and the most recent developments in the field. Korfund Co.

806:
ATTIC VENTILATION; leaflet telling of use of fans and blowers for home cooling. Chelsea Fan & Blower Co., Inc.

807:
FLOODLIGHTING of softball fields; manual explaining the basic factors in floodlighting and showing how floodlights must be designed and installed. Benjamin Electric Mfg. Co.

808:
FANS; 12-page booklet describing features of Emerson Electric Mfg. Co.'s fans. Representative fan is taken apart; each of parts is illustrated and described.

809:
CONTROLLERS FOR SYNCHRONOUS MOTORS; pamphlet describing construction and explaining the operations of complete line. General Electric.

810:
SPEED INDICATOR; description of device and its operation. Herman H. Sticht & Co.

811:
PORTABLE OIL TESTING EQUIPMENT, field and truck types, described. Operation of high-voltage testing equipment to be used in cable testing also treated. Westinghouse.

812:
LARGE POLYPHASE INDUCTION MOTORS, bracket bearing and pedestal bearing types; installation photographs illustrate diversified uses to which motor can be put. Control equipment applicable to squirrel-cage and wound-rotor motors also described. Allis-Chalmers.

813:
CLAMP-TIGHT SWITCHES; styles and applications under various conditions described in leaflet. ITE Circuit Breaker Co.

8:14
PNEUMATIC REMOTE TRANSMISSION SYSTEM for remote transmission of measurement and control where use of electrical transmission is not permissible; operation and construction described. Brown Instrument Co.

815:
THYRATRON RESISTANCE-WELDER CONTROLS; applications, illustrations, descriptions and ratings of the improved, more compact, lower priced controls. General Electric, GEA-2791A.

816:
REFRIGERATION and air conditioning equipment, parts, tools and supplies fully cataloged. California Refrigerator Co.

817:
INSTRUMENT TRANSFORMERS; 12-page discussion of coordinated insulation, double protection against impulse voltage, quick-change construction of base and terminals, etc. Westinghouse.

818:
A.C. MAGNETIC CONTACTORS for small, continuous duty, single and polyphase motors; construction and operation described in bulletin. Cutler-Hammer, Inc.

NEW BOOKS

DAMS AND CONTROL WORKS, second edition, illustrated, published by Department of Interior, $1. Book gives a cross-sectional view of problems connected with all types of dams. Chapters are included on various important dams and on High Pressure Reservoir Outlets, Hydraulic Model Testing of Structures, Structural Model Testing of Dams, Concrete Laboratory Operations, Earth Materials Laboratory Operation, Trial Method of Analyzing Arch Dams, Temperature Control of Mass Concrete in Large Dams and Design and Construction of Small Earth Dams.

●

MARKET FOR COLUMBIA RIVER HYDROELECTRIC POWER USING NORTHWEST MINERALS, by Edwin T. Hodge, consulting geologist, published by the War Department, two volumes, mimeographed 364 pages, $3.75. Volumes cover magnesia ores, where found, their economics, markets; use and technology of production and manufacture; electro-calcination; magnesia refractories.

●

GRAPHIC ROUTES TO GREATER PROFITS, by John W. Esterline, president of Esterline-Angus Co., publisher, 320 pages, 450 illustrations, $3. The book tells of the use of graphic instruments in increasing the productive capacity and efficiency of industry. Two-hundred and fifty case studies, each on a distinct problem, give procedure followed, graphic charts obtained and solution reached. Introductory section is divided into three chapters: The High Cost of Inefficiency, What Graphical Representation Means and Classification of Industrial Problems. Remainder of book is in five divisions: The Problems of Power, of Machines, of Processes, of Men and Research and Special Problems.

ELECTRICAL TESTING LABORATORIES

Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.

80th St. and East End Ave., New York

* *Thousands of* AMERICA'S FINEST RESTAURANTS USE THE CORY COFFEE BREWER

YOU CAN ENJOY THE SAME DELICIOUS COFFEE IN YOUR HOME... USING THE CORY

ALWAYS SOLD COMPLETE. THE ONE PACKAGE AND THE ONE PRICE INCLUDES ALL THESE PATENTED AND EXCLUSIVE *Features*—NO "EXTRAS" TO BUY.

- "Fast-Flo" Filter
- Bakelite Funnel Holder
- Hinged Decanter Cover
- Formed Pouring Lip
- Easy Grip Handle
- 2-Heat Electric Units [Hi-Low]
- Heat-Resisting Glass by CORNING
- Beautiful Platinum Decoration

Models for every home and restaurant need. Write for our latest catalog.

YOU'LL find you can make coffee *easier* and *quicker* with the CORY. Just one thing to remember—use your favorite brand of coffee, but have it finely ground. The CORY "Fast-Flo" Filter limits contact of water and coffee to 3 minutes. The speed means more than minutes saved. You extract only the natural, mellow coffee flavor without bitterness caused by boiling or steeping. No *metal* touches CORY-brewed coffee.

GLASS COFFEE BREWER CORP.
325 N. Wells St., Chicago, Illinois

Now Stocked on the COAST

- NICHROME wire and ribbon in all sizes.
- Likewise NICHROME V, the longer-life alloy.
- Other D-H alloys for resistance purposes.
- Alloy castings and wrought pieces on special order.

• A truly representative stock of high nickel content alloys in various shapes and sizes, particularly NICHROME (Reg. U. S. Pat. off.) is now available to the Western trade.

• So bear this local warehouse in mind.

PACIFIC COAST WAREHOUSE
316 11th Street
SAN FRANCISCO

DRIVER-HARRIS CO., HARRISON, N.J.

NICHROME

NEW PRODUCTS

Roasters

New roasters are now being marketed by Proctor Electric Co., Swartzbaugh Mfg. Co. and National Enameling & Stamping Co. Proctor's line is headed by a deluxe model, oval in shape and having a forward-slanting lid handle which protects user from burns. Swartzbaugh offers a small capacity model, complete with removable inset pan, set of aluminum half-rounds and baking rack with adjustable shelf, and a line of cooking chests. Nesco's eight-model line includes new deluxe and standard rectangular models. Deluxe model is automatically controlled with a liquid bulb thermostat and has a double-shell cover.

●

Milk Cooling Unit

Automatic "drop-in" milk cooling unit which can be installed in any standard milk cooling cabinet has been announced by Frigidaire. Unit consists of a cooling coil, which is connected to and refrigerated by means of a compressor, and a motor-driven water circulating device, enclosed in a cylindrical steel shell, which keeps water constantly circulating during cooling operation and insures temperatures below 50 deg.

●

Semi-Direct Luminaire

Correctalite is the name of a new semi-direct luminaire introduced by Holophane Co. Especially suited for use in stores, offices, etc., the luminaire is said to give greater concentration of down-light on working areas with adequate ceiling illumination. Controlling element consists of a prismatic reflector and a bottom bowl-shaped refracting member in which there is a removable plate to permit easy relamping.

●

Hinged Door Floodlights

For floodlighting athletic fields, service stations, etc., five floodlights have been introduced by Westinghouse. Ease of maintenance, relamping, cleaning or servicing are said to be characteristic of these lights because of their dust-tight, moisture-proof cover doors. Reflector is spun from aluminum and is either etched for a wide beam or polished for a narrow beam. Same socket housing and mounting brackets on all type AH floodlights so that interchanging reflector sizes or types is possible.

●

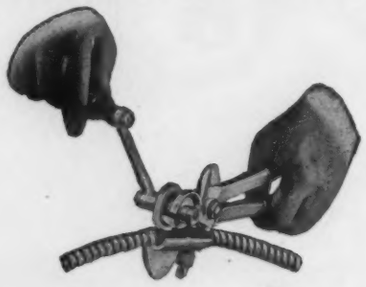
Air Conditioners

Five companies are marketing new air conditioners. General Electric offers a three-ton conditioner which has a built-in, soundproof condensing unit and does not require ductwork in installation. Westinghouse offers a compact, self-contained unit especially suitable for medium-small commercial establishments. The unit can be adapted to winter air conditioning. Carriers' compact, portable unit offers a development which admits a larger quantity of outside air and builds in the conditioned room a pressure slightly in excess of the adjoining room. This is said to provide added ventilation facilities for elimination of smoke and odors. General Motors' Delco-Frigidaire Conditioning Division offers a portable unit said to be the first to incorporate the hermetically sealed meter-miser which does away with belts, pulleys, etc. Also introduced by Delco-Frigidaire is a three-ton capacity, self-contained unit for retail establishments and other commercial applications. Pleasantaire Corp. offers its room cooler which fits into the window, plugs in like a radio.

●

Cable Cutter

New safety cable cutter which will cut any type or size of armored electrical cable in any position has been introduced by Mechanical Products Corp. The incision made in the cable by a revolving saw is a diagonal cut deep enough to sever only one convolution of the



armor. The cut armor then slips off over conductors without forcing. The manufacturer claims that the cutter holds the cable in stationary position without effort; that once set, the cutting saw never touches the insulation; that hands, knees and clothes are protected.

●

Mercury Plunger Switches

Mercury plunger switches designed for use as a.c. relays or cross-the-line starters have been announced by H-B Electric Co., Inc. Energizing the coil pulls down a plunger within a glass tube which displaces the mercury which closes the circuit. High-speed closing and opening is claimed and 30-amp. or 1-hp. a.c. rating is given.

●

Magnetic Circuit Breaker

A small, compact magnetic circuit breaker for control and protection of fractional horsepower motors in rating from ¼ to 35 amp., and including a time-delay unit, has been announced by Heinemann Electric Co. All moving parts except tumbler handle are enclosed in a molded, bakelite case which is 3 7/32 x 1⅞ x 2 11/16 in.

●

Industrial Fan

For cleaning and filtering, or blowing air around welding, or grinding and other machine operation, Lincoln Electric Co. has introduced a device called "Linconditioner". It consists of a motor-driven fan which produces suction through a flexible metal tube. Air is exhausted through a filter in the periphery of the power unit. For blowing, the flexible tube can be attached to the blower outlet. Fan is powered by a ½-hp. two or three phase motor furnished for 110 and 220 or 440 volts.

●

Disc-Operated Thermostat

For use with fractional hp. motors, Spencer Thermostat Co. has announced a simple disc-operated thermostat containing no magnets, springs or toggles. It consists of a small thermostatic bimetal disc placed next to a heater wire. Contacts, welded to the disc, are in series with the line circuit. It is said to be easy to install and to follow closely the heat rise in the motor winding, compensating automatically for varying ambient vs. load conditions.

●

Safety Strap Fabric

A fabric for lineman's safety straps and other uses which gives a visual indication when it has worn to the point where it should be discarded has been announced by Mathias Klein & Sons. Called "Red Center Klein-Kord" it is made of six plies of cotton, vulcanized in rubber. Red rubber is used on the two center plies. The strap may be used with safety until two outside plies are worn completely through.

●

Two-Lamp Transformer

TuLamp is a new transformer by General Electric designed to operate two 400-watt type H mercury lamps at peak efficiency and at 90 to 95 per cent power factor. Claimed as advantages are a 20 per cent reduction in initial cost, savings in installation cost and reduction of losses by 30 per cent as compared to two single line transformers. Starting currents are below the normal operating current. Should one lamp burn out, the other will operate normally.

●

Midget Relays

New midget relays with basis measuring 2x2¼ in., have been announced by Ward Leonard Electric Co. They are available with single pole, double break, normally open contacts for either a.c. or d.c.

●

Feeder Safety Switch

An inexpensive, low-capacity feeder safety switch to displace open knife switches in mines and industrial plants is offered by Ohio Brass Co. It is of the quick moving type for 250 to 600 volts, 300 and 400 amp. sizes. It is enclosed in a fire-proof case and carries a heavy rubber handle.

●

Overhead Ground Wire Bracket

Claimed to save 6 in. of pole height is a bracket for supporting overhead ground wires developed by Ohio Brass Co. It consists essentially of a clamp which pivots 15 deg. above or below neutral on two pintles which are part of the bracket proper. It holds wire from ¼ to 9/16 in.

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P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

ELECTRIC APPLIANCE SOCIETY OF NORTHERN CALIFORNIA

AUGUST

ELECTRIC RANGE AND WATER HEATER CAMPAIGN

In rural areas where P.G. and E. serves electricity only, the August advertising will feature electric ranges and water heaters. One advertisement will appear each week in 83 dailies and weeklies, supported by billposters, truck banners, bill-stickers and window displays. If you sell ranges and water heaters and do business in any of the communities where our advertising is scheduled to appear, see your newspaper and arrange for a series of tie-in advertisements to be published along side.

DEALERS: By watching this page from month to month you can keep informed of sales promotional campaigns to be sponsored by the Pacific Gas and Electric Company and the Electric Appliance Society. Detailed information will be supplied, as usual, through the mail. If such information is not received, call our local office or write Electric Appliance Society, 1355 Market St., San Francisco, Calif.

EW 108-838

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THE CART BEFORE THE HORSE

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Appliance manufacturers and dealers for the past few years have found many markets closed to them because of inadequately wired homes and commercial buildings. Today air conditioning is hailed as promising the greatest potential market for equipment and service in the immediate future. Inadequately wired buildings are proving a serious handicap in its popular acceptance.

Selling wiring isn't a "one man" or a "one group" job—it's a full-time job for every man in the industry. And adequate wiring is the industry's most important story right now.

Invest a little support now in the promotion of adequate wiring and insure years of fertile markets for your products and services.

Distribute wiring literature. Carry a line on all your advertising, on your bills, and letterheads, calling attention to the importance of adequate wiring. *Talk wiring at every opportuntiy.*

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